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Herbert Hoover Dike (HHD) Phase 1A Groundwater Model

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Final report

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Abstract: This report presents the project that ERDC and NAP were tasked by SAJ to construct the HHD Phase 1A model. The purpose of the HHD Phase 1A modeling effort was to develop and evaluate a Lake Okeechobee sub-regional groundwater numerical model, and evaluate the sub-regional groundwater changes associated with the introduction of the cutoff wall segments into the subsurface geologic structure underlying Herbert Hoover Dike (Reaches 1 through 3). This report describes the background and goal, the modeling approach, the modeling tools, the collection and compilation of data used for model construction, the model construction processes, and the analysis of simulation results. A steady-state, 3-D groundwater model was developed to evaluate and bound the potential effects of the proposed cutoff wall. The computational results from the "with project", i.e., with cutoff wall, simulations were compared to those from the "without project", i.e., no wall, simulations in order to develop estimates of potential impacts to the sub-regional groundwater heads and flows. A two-stage analysis was conducted to effectively achieve the purpose of this study. Stage 1 sensitivity analysis, including 46 model runs, was used to determine the three most influential subsurface materials from the 11 materials considered. Stage 2 impact analysis, comprised 96 model runs, was used to investigate the cutoff wall effect at various combinations of net recharge and head boundary conditions, pumping, and hydraulic conductivity.

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Preface

This report summarizes the modeling effort undertaken in developing and evaluating a sub-regional computer model, and the evaluation of the groundwater changes associated with the introduction of the cutoff wall segments into the subsurface geologic structure underlying Herbert Hoover Dike (Reaches 1 through 3). A steady-state, 3-D groundwater model was developed to evaluate and bound the potential effects of the proposed cutoff wall. A two-stage analysis was conducted to effectively achieve the purpose of this study. Stage 1 sensitivity analysis was designed to determine the three most influential subsurface materials from the 11 materials considered. Stage 2 impact analysis, including 48 comparison scenarios, was used to investigate the effects cutoff wall on groundwater water flow, where net recharge and head boundary conditions, pumping, and hydraulic conductivity values of the three materials determined from Stage 1 analysis varied at different scenarios.

Principal investigators for this study were Dr. Hwai-Ping Cheng, Barbara P. Donnell, Earl V. Edris of the Hydrologic Systems Branch, Coastal and Hydraulics Laboratory (CHL), U.S. Army Engineer Research and Development Center (ERDC), and Stephen M. England, Philadelphia District (NAP), U.S. Army Corps of Engineers. Dr. Cheng and Donnell conducted their portion of the task under the general supervision of Earl V. Edris, Chief of Hydrologic Systems Branch, CHL; Bruce A. Ebersole, Chief of Flood and Storm Protection Division, CHL; and Dr. William D. Martin, Director of CHL.

COL Gary E. Johnston was Commander and Executive Director of ERDC. Dr. Jeffery P. Holland was Director.

Dr. Kang-Ren Jin (SFWMD), Dr. Cary Talbot (CHL), and Glen Stevens (CE NAP) reviewed this report and provided valued comments.

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Executive Summary

ERDC and NAP were tasked by SAJ to construct the HHD Phase 1A model. The modeling effort was funded based on the items defined in the SOW of the HHD Phase 1A model development project (see in Appendix A), developed jointly by SAJ, ERDC, and NAP. The purpose of the HHD Phase 1A modeling effort is to develop and evaluate a Lake Okeechobee sub-regional groundwater numerical model, and evaluate the sub-regional groundwater changes associated with the introduction of the cutoff wall segments into the subsurface geologic structure underlying Herbert Hoover Dike (Reaches 1 through 3), the containment levee system that defines the perimeter of Lake Okeechobee surface water storage.

A steady-state, 3-D groundwater model, as defined in the Proposed Modeling Effort section of the SOW (Appendix A), was developed to evaluate and bound the potential effects of the proposed cutoff wall. The computational results from the "with project", i.e., with wall, simulations were compared to those from the "without project", i.e., no wall, simulations in order to develop estimates of potential impacts to the sub-regional groundwater heads and flows. Groundwater head was computed between the with- and without-project conditions throughout the model domain and along selected landside transects that extend perpendicular to the HHD. The groundwater flows through 21 cross-sections; seven in each HHD reach were compared in this task. These cross-sections were set parallel to the wall at a spacing of 50, 100, 200, 500, 1,000, 5,000 and 10,000 ft from the land-side toe of HHD.

Geologic data from various sources were compiled to construct the conceptual hydro-geologic model, where 11 subsurface materials were taken into account. Historical data of rainfall, evapo-transpiration (ET), groundwater head, and canal stage were compiled and used to define high, medium, and low net recharge and head boundary conditions. Compiled permit capacity and specification pumping information were used to define the high and low pumping conditions as the sink term in the model. The high and low values of net recharge, head boundary conditions, and groundwater pumping, determined based on the historical field data, were used to bracket the hydrologic conditions of the modeled system, so that

the associated results would provide reasonable estimates on the cutoff wall impact.

The ERDC in-house numerical model, WASH123D, and DoD Groundwater Modeling System (GMS 6.0) were employed to compute subsurface flow and set up simulation runs for this project. A specific design of the cutoff wall depth, provided by SAJ, was incorporated into the computational mesh to investigate its potential impact on sub-regional groundwater flow.

A two-stage analysis was conducted to effectively achieve the purpose of this study. Stage 1 sensitivity analysis, including 46 model runs, was designed to determine the three most influential subsurface materials from the 11 materials considered. Stage 2 impact analysis comprised 96 model runs, representing 48 comparison scenarios associated with various combinations of net recharge and head boundary conditions, pumping, and hydraulic conductivity values of the three materials determined from Stage 1 analysis.

The main findings from this project include: (1) The impact of cutoff wall on hydraulic head decreased with the distance away from HHD, while the hydro-static (no vertical flow) condition did not exist in the vicinity of HHD when the cutoff wall was in place; (2) With the net recharge and head boundary conditions based on the historical data, the overall groundwater heads throughout the model were reduced as summarized in Appendix F for the high, medium, and low lake/net recharge conditions. In general, the difference in groundwater head between the without cutoff wall and the with cutoff wall conditions decreased with the lake level but increased with the groundwater pumping rate. Therefore, a high lake and high pumping rate resulted in a maximum number of groundwater head reductions throughout the model, while a low lake and low pumping rate resulted in the minimum number of groundwater head reductions. The expected critical condition of a low lake and high pumping rate resulted in groundwater stage reductions as summarized in Table F5 and as shown in Figures F33 through F40. The groundwater head was reduced due to installation of the cutoff wall, on the average, by about 0.02 to 0.31 ft (see the MA Diff column in Tables F1 and F2) at the high condition, by about 0.01 to 0.28 ft at the medium condition (see the MA Diff column in Tables F3 and F4), and by 0.01 to 0.21 ft at the low condition (see the MA Diff column in Tables F5 and F6); (3) Given the hydro-geologic model constructed in the project, Materials L2-1, L3A, and L3B-2 were more influential than the other eight

subsurface materials on the groundwater flows through the 21 cross-sections of interest; (4) The overall average cross-sectional flow difference that accounts for the cutoff wall impact, increased with the hydraulic conductivity values of Materails L2-1 and L3A, but decreased with the hydraulic conductivity value of Material L3B-2; (5) The overall average cross-sectional flows were reduced by 0.02 to 0.35 cfd per unit length of HHD (cfd/ft-HHD) at the high condition (see Tables 18 and 19), 0.01 to 0.24 cfd/ft-HHD at the medium condition (see Tables 20 and 21), and less than 0.01 (i.e., insignificant) to 0.04 cfd/ft-HHD at the low condition (see Tables 22 and 23) when the wall is in place; (6) the magnitude of cutoff wall impact on the groundwater head with the model domain depends on the location of interest; (7) boundary conditions and source/sink terms (i.e., pumping wells and surface water bodies) applied to the model will also affect the magnitude of the cutoff wall impact.

As stated in the SOW of the project, the goal of this HHD Phase IA steady-state modeling is to indicate the magnitude of impact a cutoff wall would have on the sub-regional groundwater. The modeling provides a range of potential impacts utilizing an array of hydrologic scenarios, rather than a calibrated analysis, of how the cutoff wall would impact the sub-regional groundwater. It is also to identify important factors for refined, design-level analysis in the future if determined necessary. It was understood that additional coordination among SAJ, ERDC, and NAP would need to occur to integrate the model results with the performance measures by which SAJ intends to evaluate the HHD rehabilitation effort. Without this coordination and without input from SAJ's experts, it will be difficult for the ERDC and NAP modelers to determine if the modeled impacts are significant and adverse. This coordination between SAJ and the modelers is also necessary to ensure that model results are not inadvertently misinterpreted.

The next step in this process involved the modelers and SAJ's HHD experts, including representatives from its Office of Counsel, meeting to discuss the comments (and responses) that were generated on the Phase IA modeling report. This meeting was intended to bring the team to a consensus on the "significance" of the impact to sub-regional groundwater flow resulting from the proposed cutoff wall. If impacts are determined to be significant and adverse, then two courses of action are possible. The first would be an evaluation of the existing systems (gate/canal/pumping networks) to determine if potential impacts can be mitigated through changes to the existing operational rules, including making surface water

available to a user in order to compensate for any loss in groundwater supply. If this is not plausible and additional information is needed to quantify the potential impacts, additional transient modeling could be pursued as described in the original modeling scope (see Appendices A and B). However, the issue of whether this modeling might proceed would depend on the specific questions that SAJ needs to have answered and the sufficient availability of data that would be needed to construct a calibrated and validated transient model.

To make the flow of the report text smoother, many pieces of supporting information are placed in appendices. In addition to the main text, there are five appendices associated with this report. Appendix A is the scope of work for development of the HHD Phase 1A model. Appendix B discusses a second HHD modeling approach as referred in Appendix A. Appendix C provides 67 tables and 25 figures to show the Stage 1 model run results. Appendix D includes 48 tables to present the Stage 2 model run results concerning the cross-sectional flow. Appendix E provides plots to show the historical data of both groundwater total head and canal water stage used for the HHD Phase 1A model. Appendix F includes 6 tables and 48 figures to show the distribution of pressure head difference of the 48 pairs of comparison considered in Stage 2 analysis.

ERDC and NAP met with SAJ and presented the modeling effort on October 30, 2007 in Jacksonville, FL. They were requested at the end of the presentation meeting to help prepare the HHD EA report by providing the following information.

1. Text in the modeling report describing the QA/QC procedures that were used during model development and analysis.
2. Numbers and locations of the additional wells that went "dry" during the "with project" simulations.
3. The minimum and maximum distances from the wall to various computed head differential values at 0.1, 0.5, 1.0, and 2.0 ft for model run pairs compared in Tables F3 and F5 (These minimum and maximum distances are measured by using the arc feature in GMS 6.0 for Reaches 1A, 1B, 1C, 1D, 2, and 3).
4. Updated the head difference plots of Runs 17 through 24 and Runs 65 through 72 in Table F3 and Runs 33 through 40 and Runs 81 through 88 in Table F5) with the locations of the pumping wells that were incorporated into the model.

5. A project summary for the EA report with the information specified below provided.

    a. Conclusion of the results shown by the difference maps for (1) the low net recharge and low head boundary condition with high pumping and (2) the medium net recharge and head boundary condition with high pumping.

    b. Summary information on where the “k” values were derived from (i.e., list which models or historical information).

    c. The K values utilized for the other eight layers in Stage 2 cutoff wall impact evaluation.

    d. The minimum net recharge amount assumed in the model.

For convenience, the information for all of the aforementioned requests is given in a separate appendix, Appendix G, except for the QA/QC procedures. The QA/QC procedures are described in Sections 3.12, 4.7, and 5.3 for data compilation, model construction, and simulation results and post-processed data, respectively, in the main text.

1 Introduction

Background

The Herbert Hoover Dike (HHD) is an earthen dike system that encircles Lake Okeechobee for 140 miles (http://www.saj.usace.army.mil/pao/hotTopics/LO_HHD_files/LakeOandHHDike.pdf). The dike system has numerous water control structures to provide flood protection, navigation, recreation and freshwater for the communities of south Florida, water for agriculture, prevention of saltwater intrusion, and enhancement of environmental resources. Records covering the performance of the dike system during major flood events indicate that the embankment and foundation of the structure are susceptible to significant seepage and piping erosion when the reservoir reaches critical levels during these flood events. The causes of the seepage and piping are related to the geometry, materials, and methods used in the construction of the dike and in the complex and variable geology comprising the foundation of the dike system.

Project goal

With the goal of ensuring that a reliable dike system is provided along the perimeter of Lake Okeechobee, the U.S. Army Corps of Engineers, Jacksonville District (SAJ) has tasked the U.S. Army Engineer Research and Development Center (ERDC) and the U.S. Army Corps of Engineers, Philadelphia District (NAP) with developing a groundwater flow model in the vicinity of HHD. The model is to evaluate the effect of a proposed cutoff wall, one of the options to correct the problems with the dike, along the HHD (Reaches 1, 2, and 3, Figure 1) on the sub-regional groundwater regime.

Approach

A multi-phase Scope of Work (SOW) was developed to address different aspects of the proposed cutoff wall project, while expediting model construction. The first phase of this modeling effort includes the development of a steady-state, 3-D groundwater model to qualitatively evaluate the effects of the proposed cutoff wall. The model domain covers approximately 850 square miles as shown in Figure 2. The model area is bounded in the north by Lake Okeechobee (approximately 1 to 2 miles into

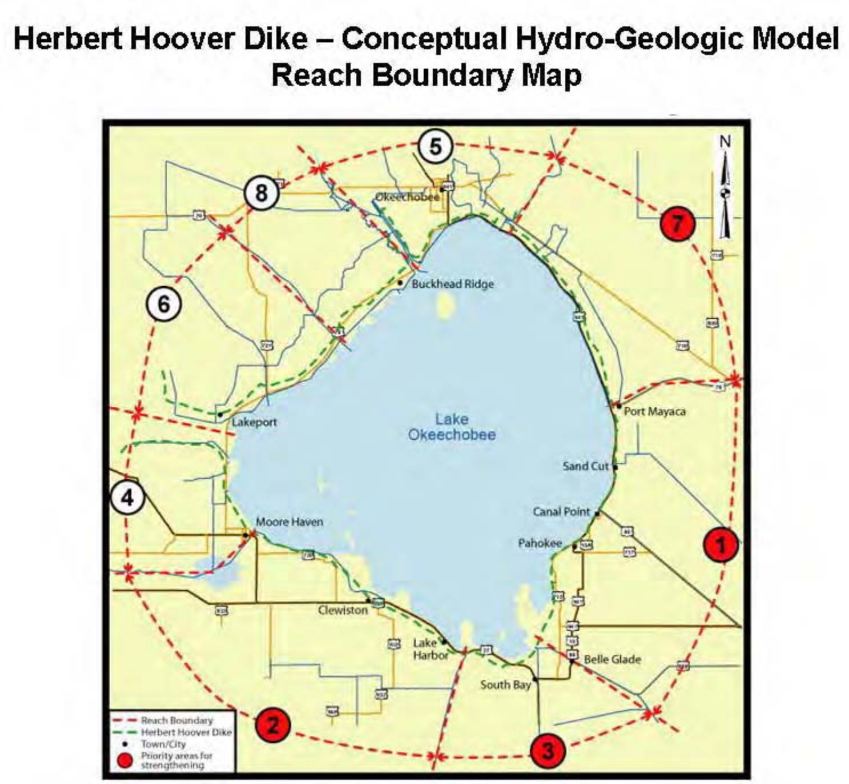

Figure 1. Eight reaches defined for the Herbert Hoover Dike conceptual hydro-geologic model (provided by SAJ).

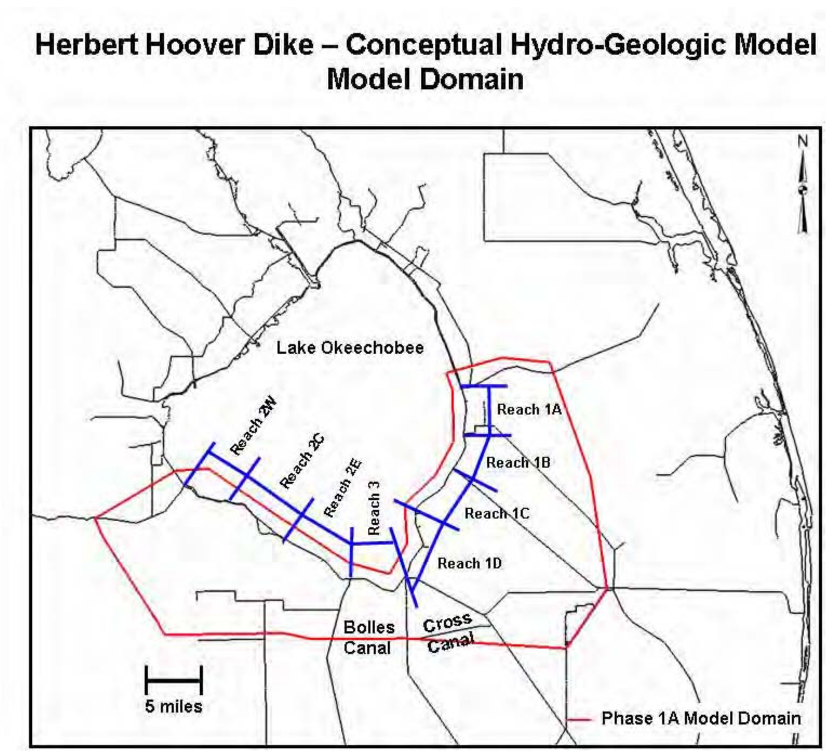

Figure 2. The conceptual hydro-geologic model domain boundary for HHD Phase 1A model.

the Lake) and to the south by the Bolles and Cross canals. Vertically, the model extends from ground surface to elevation -250 ft. NGVD29, which is within the upper portion of the Hawthorn Group.

One "with project" design configuration for the cutoff wall, provided by SAJ, was evaluated during this modeling phase. The results from the "with project" simulation were compared to those from the "without project" simulation to develop order of magnitude estimates of changes to the sub-regional groundwater flow. Groundwater flows through cross-sections parallel to the wall at spacings of 50, 100, 200, 500, 1,000, 5,000 and 10,000 ft from the toe of HHD on the land side were compared in this task.

Based on the groundwater pumping capacity and the historical records of groundwater head, Lake Okeechobee stage, canal stage, rainfall, and ET, the high, medium, and low values for each data set were defined as the value of the 95^{th}, 50^{th}, and 5^{th} percentiles, respectively. These values were used in the sensitivity analysis considered in this study, which includes two stages. In Stage 1, the medium values were used to construct an average hydrologic condition to determine which three of the eleven subsurface materials considered in the model would impact groundwater flow the greatest in both "with project" and "without project" scenarios. In Stage 2, various combinations of rainfall-ET, head boundary conditions, pumping rates, and hydraulic conductivities of the three subsurface materials determined in Stage 1 were employed to form computer simulations covering a wide range of hydrologic condition. Results from the corresponding "with project" and "without project" simulation runs were compared to show the changes of groundwater flow through the cross-sections mentioned above. Conclusions were then drawn according to the comparison results. Additional details concerning the phasing of this modeling effort are contained in the SOW (Appendix A) and were emailed to SAJ on 16Feb07 (HHD Phase 1 Modeling Plan-2-16-07.doc).

2 Modeling Tools

The two major tools used in this modeling task were WASH123D and GMS 6.0, where WASH123D computed subsurface flow and GMS 6.0 generated unstructured finite element meshes and set up simulation runs.

WASH123D

WASH123D (Yeh et al. 2006) is a physics-based finite element numerical model that computes water flow in watershed systems that can be conceptualized as a combination of 1-D channel networks, 2-D overland regimes, and 3-D subsurface media. In the computer program of WASH123D that ERDC maintains, 1-D channel flow is computed by solving the cross-section area-averaged diffusive wave equation, 2-D overland flow by the depth-averaged diffusive wave equation, and 3-D variably saturated subsurface flow by the Richards equation. The steady-state version of the Richards equation, Equation 1, was solved with the Galerkin finite element method (Galerkin 1915) in WASH123D for all model runs considered in this study.

$$\nabla \cdot \left[k_r \mathbf{K}_s \cdot \left(\nabla h + \nabla z \right) \right] + q = 0 \tag{1}$$

where:

h = the pressure head [L];
k_r = the relative hydraulic conductivity [dimensionless];
$\mathbf{K}_s$ = the saturated hydraulic conductivity tensor [L/t];
z = the potential head [L];
q = the source/sink term [$L^3/L^3/t$].

GMS 6.0

The Department of Defense Groundwater Modeling System (GMS, http://chl.erdc.usace.army. mil/gms) is the most sophisticated groundwater modeling environment available today. The Department of Defense, in partnership with the Department of Energy, the U.S. Environmental Protection Agency, the U.S. Nuclear Regulatory Commission and 20 academic partners, has developed the DoD Groundwater Modeling System. The GMS provides an integrated and comprehensive computational environment for simulating

subsurface flow, contaminant fate/transport, and the efficacy and design of remediation systems. GMS integrates and simplifies the process of groundwater flow and transport modeling by bringing together all of the tools needed to complete a successful study. GMS provides a comprehensive graphical environment for numerical modeling, tools for site characterization, model conceptualization, mesh and grid generation, geostatistics, and sophisticated tools for graphical visualization. There is a WASH123D graphic user interface (GUI) included in GMS 6.0.

3 Data used for model construction

To construct groundwater models for this study, the data mentioned in this section were collected, compiled, and analyzed to be incorporated into the HHD Phase 1A model.

Datums

Numerous data sources were compiled to generate the conceptual model and model input parameters. All data sets were converted to a common horizontal and vertical datum. The horizontal datum used for this HHD model was the North American Datum of 1983 (NAD83), State Plane Florida East. The North Atlantic Vertical Datum of 1988 (NAVD88) was used as the vertical datum to build the HHD model in this project. Because the majority of the input field data was provided in the National Geodetic Vertical Datum of 1929 (NGVD29), the conceptual model report used the NGVD29 vertical reference to expedite analysis. Any data received not in this coordinate system was converted using the coordinate conversion software, Corpscon, version 6.0, developed by the Topographic Engineering Center (TEC) of the U.S. Army Corps of Engineers.

Topography

The top of the HHD model was set at ground surface. The top surface of the model, representing ground surface, was determined based on topographic and bathymetry data provided by SAJ for the Regional Aquifer Storage and Recovery (ASR) project on 03May06. This topographic data was in the NGVD29 vertical datum and had a uniform horizontal grid resolution of 1000 ft. This topographic data was linearly interpolated to the finite element meshes used in the modeling. The interpolated topographic surface was then modified to incorporate the details of specific surface features such as canal bottoms and dike tops. Based on consultations with SAJ-EN-GG, both the dike top and the top of the proposed cutoff wall were set at a uniform elevation of 32 ft NGVD29. The top of canal dikes were generally set to 10 ft above the surrounding ground surface. Figure 3 shows the contours of the ground surface used to build the HHD model.

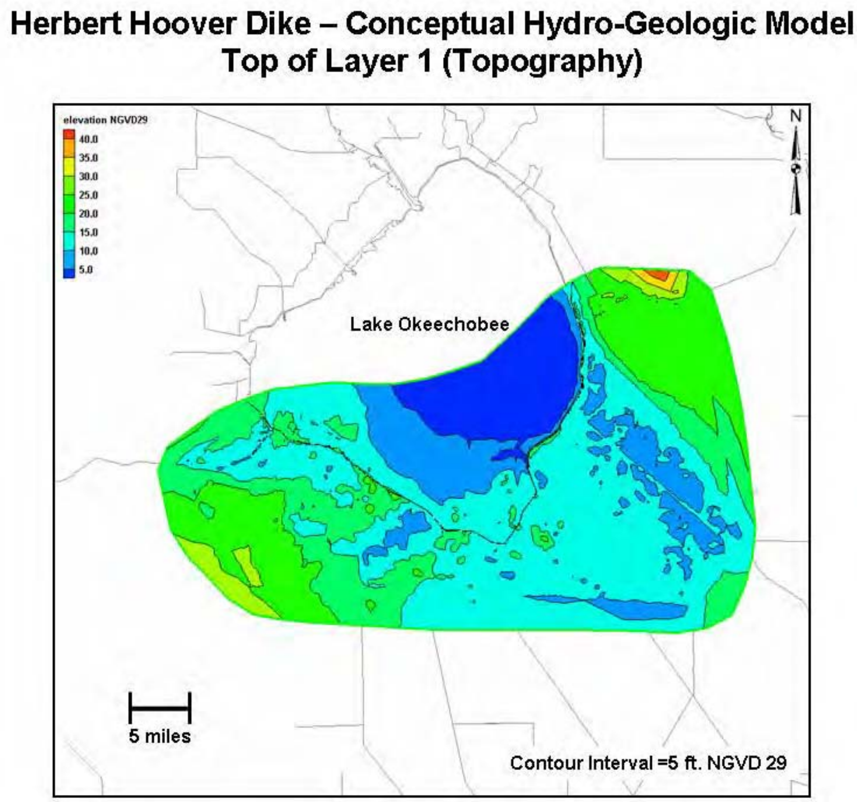

Figure 3. Surface elevation map for the top of Layer 1 of hydro-geologic model for HHD Phase 1A model.

Geology

Numerous geologic interpretations have been developed to date for the Surficial Aquifer System (SAS) geology in the vicinity of this model. SAJ provided information for many of these interpretations, including:

1. DRAFT Conceptual Hydrogeologic Framework Report for Regional Engineering Model for Ecosystem Restoration (REMER) dated 23Dec05 (USACE 2005)
2. MIKESHE Model - B.2 HYDRAULICS B.2.2 HYDROLOGIC MODELING/ METHODOLOGY REPORT dated January 2004 (USACE 2004)
3. Geologic cross sections comprised of approximately 270 borings along the Herbert Hoover Dike alignment (Reaches 1, 2, and 3) (USACE 2007)
4. Florida Geological Survey (FGS) borings (16 total) in the vicinity of the model
5. Major Rehabilitation Report – Reach 1 dated June 2006 (USACE 2006a)
6. Major Rehabilitation Report – Reach 2 & 3 dated December 2006 (USACE 2006b)

During meetings held between SAJ-EN-GG and SAJ-EN-WM and NAP between 06Mar07 through 09Mar07, it was determined that the REMER geology, i.e., Item (1) above, would be augmented with dike alignment borings, i.e., Item (3) above, and FGS borings, i.e., Item 4 above, to build the conceptual geologic model for this project. The geologic interfaces in each boring were identified with the assistance of SAJ-EN-GG. The use of the regional REMER data coupled with the borings allowed both regional trends and site specific information to be honored. In the vicinity of this model the geologic layering was defined as follows:

1. Layer 1 - Undifferentiated Surface Soils including embankment fill for the dike
2. Layer 2 - Fine/Organic Layer including peat, clays and silts
3. Layer 3A - Limestone, Rock, Sand and Shell beds
4. Layer 3B - Sand with Shell
5. Layer 4 - Pinecrest Sand member of Tamiami Formation
6. Layer 5 - Ochopee Limestone member of the Tamiami Formation and the Gray Limestone
7. Layer 6 - Lower Tamiami Formation sands and non-productive sands of the Miocene Peace River Formation
8. Layer 7 - Upper Hawthorn Group and Sand Stone Aquifer

This geologic layering for the model was determined primarily based on hydro-geologic properties of each layer. This nomenclature is identical to that used in the REMER Hydro-geologic Framework, with one exception: Layer 3 from the REMER Framework has been subdivided into Layer 3A to represent limestone and Layer 3B to represent the sands below the limestone in Layer 3. Generally, the Layer 3A limestone is more permeable than the underlying sands. The current cutoff wall design penetrates through the Layer 3A limestone into, but not fully penetrating, the Layer 3B sands. To replicate the flow fields resulting from the wall accurately, Layers 3A and 3B needed to be modeled individually.

Approximately 270 geologic borings have been logged along the HHD alignment in the vicinity of Reaches 1, 2, and 3. The ground surface elevation and depths of these borings vary; however, these boring generally do not penetrate deeper than elevation -50 ft NGVD29. SAJ-EN-GG has developed cross-sectional representations of the shallow geologic materials along the dike alignment using these borings (USACE 2007). Information related to the development of these cross-sections is contained in the Major

Rehabilitation Reports (MRRs) (USACE 2006a, 2006b). Based on discussions with SAJ, these dike alignment borings and cross-sections were used to define Layers 1, 2, and 3A for the Phase 1A model. Figures 4 through 11 show the SAJ cross-sections along the dike alignment and the hydro-geologic interpretations of borehole information used in GMS to construct the Conceptual Model. The color code for the SAJ cross sections is shown on Figure 4. The cylindrical GMS boreholes in these figures represent the overburden/fill material (tan); the peat, clay, and silt layers (brown) that generally exist below the fill; and the limestone layer (blue). The vertical extents of each of these layers were determined based on discussions with SAJ-EN-GG during the week of 06Mar07 through 09Mar07. The assumed top of dike (elevation of 32 ft NGVD29) was used for the top of each GMS borehole along the dike alignment. However, the topography discussed in the previous section was actually used to set the top surface of the model. Also shown on these figures is the proposed cutoff wall tip elevation (red line). As discussed in the "Cutoff Wall Configuration" Section of this report, the cutoff wall tip elevation was provided by SAJ-EN-GG. In each figure, the proposed cutoff wall tip elevation appears to be at or below the area defined as the highly conductive limestone (Layer 3A).

In addition to the dike alignment borings, the geologic classifications from the REMER Hydro-geologic Framework Report were used to define the deeper geologic units, as well as the lateral extents of Layers 1, 2, and 3A. Upon review of the REMER Hydro-geologic Framework data, it was observed that several elevations used to generate the layer interface elevations did not correspond to the available topography. After consultation with SAJ-EN-GG, it was determined that the elevations for the top of the boreholes in the REMER database may not be as accurate as the topographic data. To correct for this discrepancy, the ground surface elevation from the topographic data described in the section above was used to re-compute the elevation of each geologic layer in the REMER database. This ensured that the reference ground surface elevation was consistent for the various data sets.

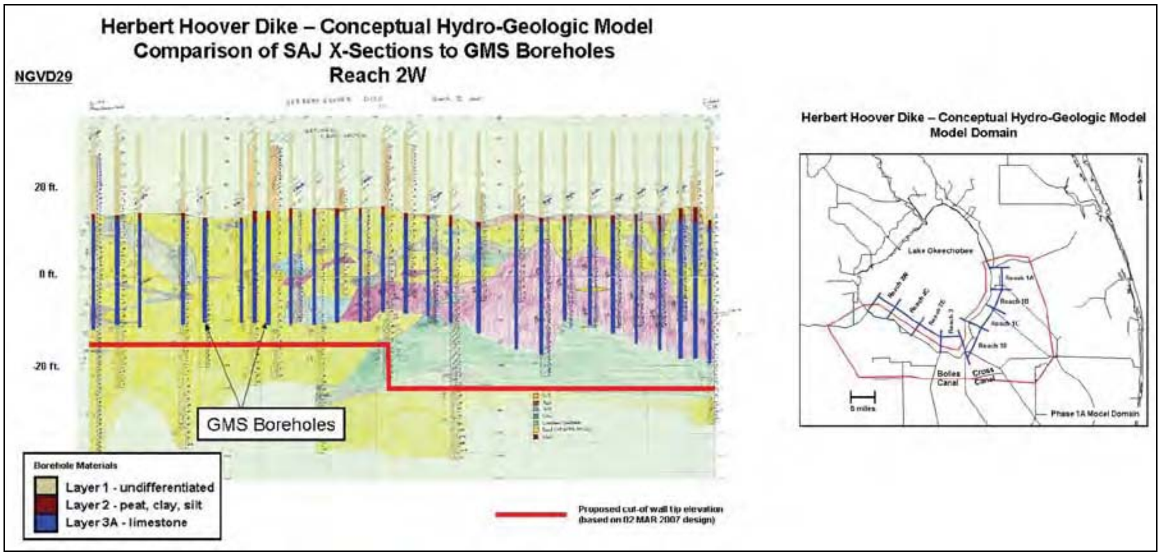

Figure 4. Comparison of SAJ cross-sections to GMS boreholes at Reach 2W of the HHD Phase 1A model.

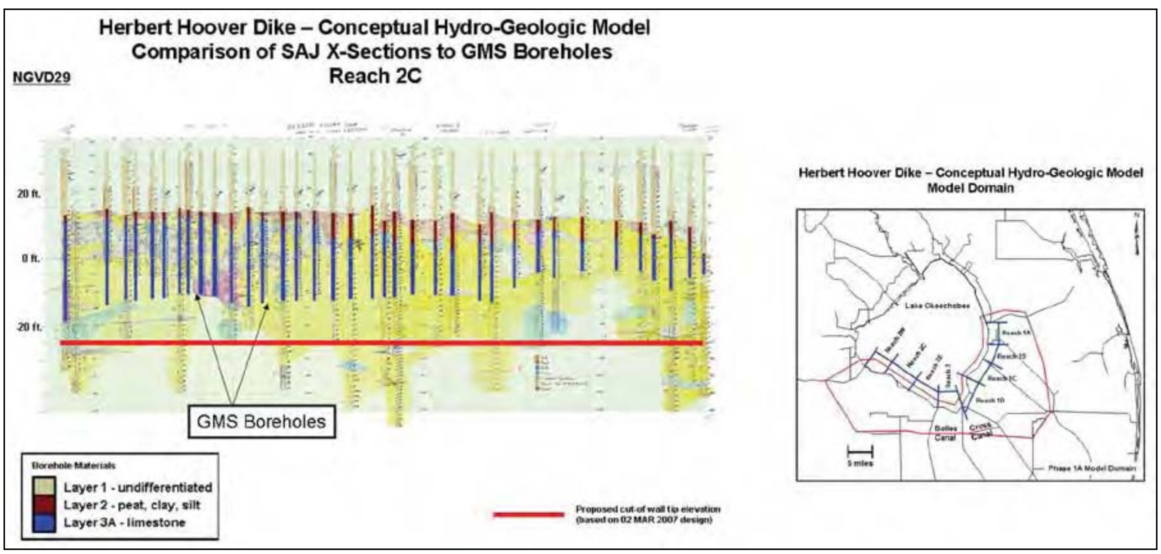

Figure 5. Comparison of SAJ cross-sections to GMS boreholes at Reach 2C of the HHD Phase 1A model.

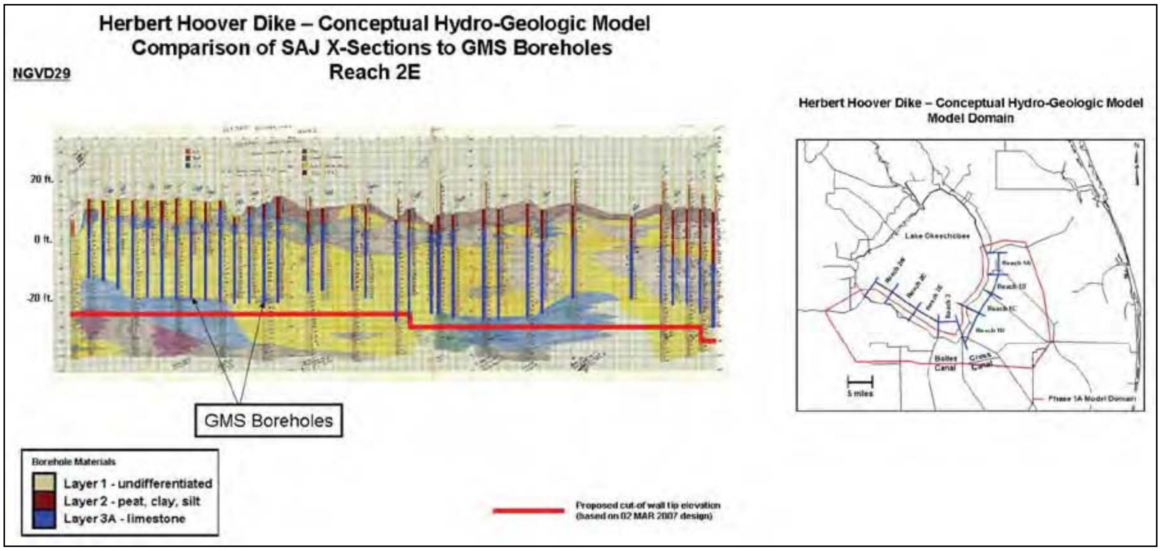

Figure 6. Comparison of SAJ cross-sections to GMS boreholes at Reach 2E of the HHD Phase 1A model.

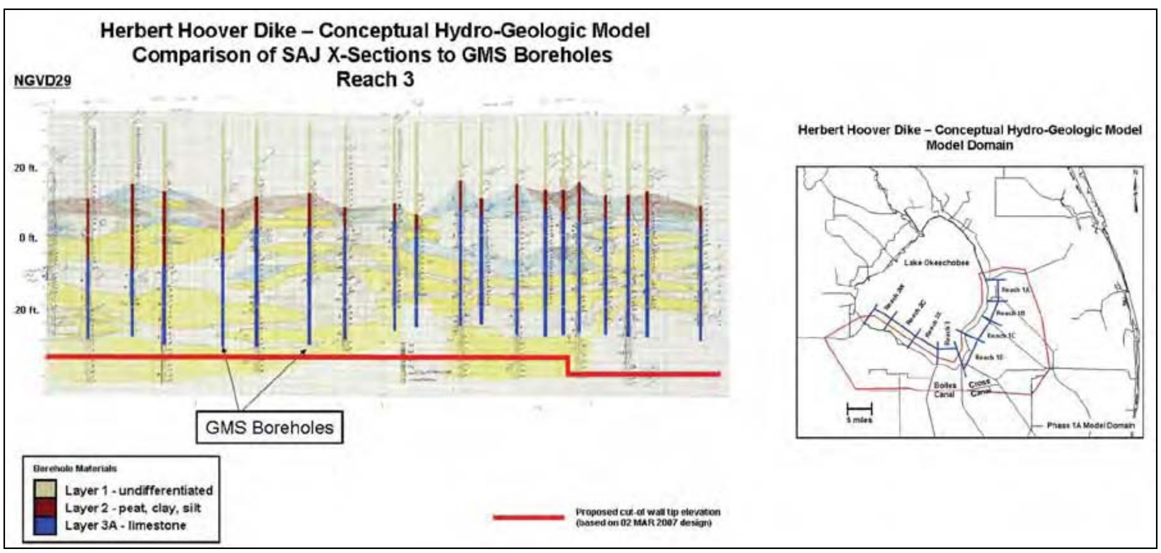

Figure 7. Comparison of SAJ cross-sections to GMS boreholes at Reach 3 of the HHD Phase 1A model.

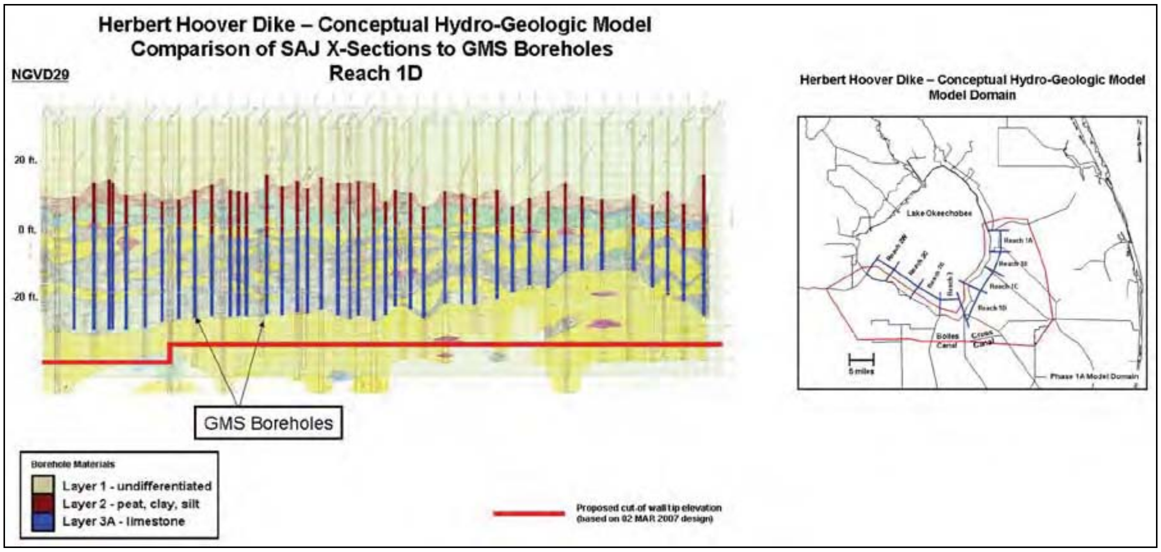

Figure 8. Comparison of SAJ cross-sections to GMS boreholes at Reach 1D of the HHD Phase 1A model.

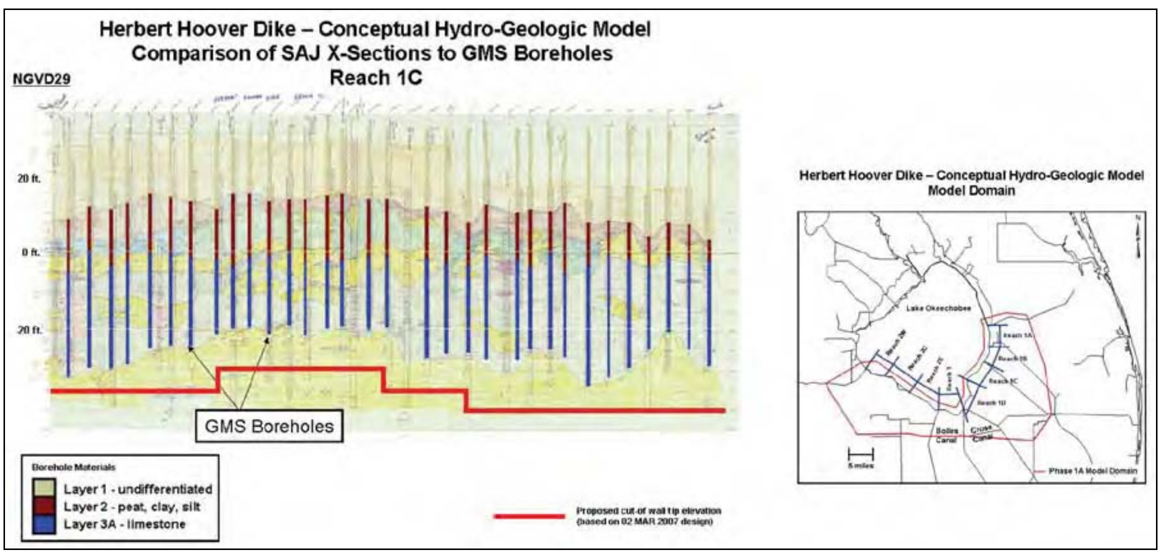

Figure 9. Comparison of SAJ cross-sections to GMS boreholes at Reach 1C of the HHD Phase 1A model.

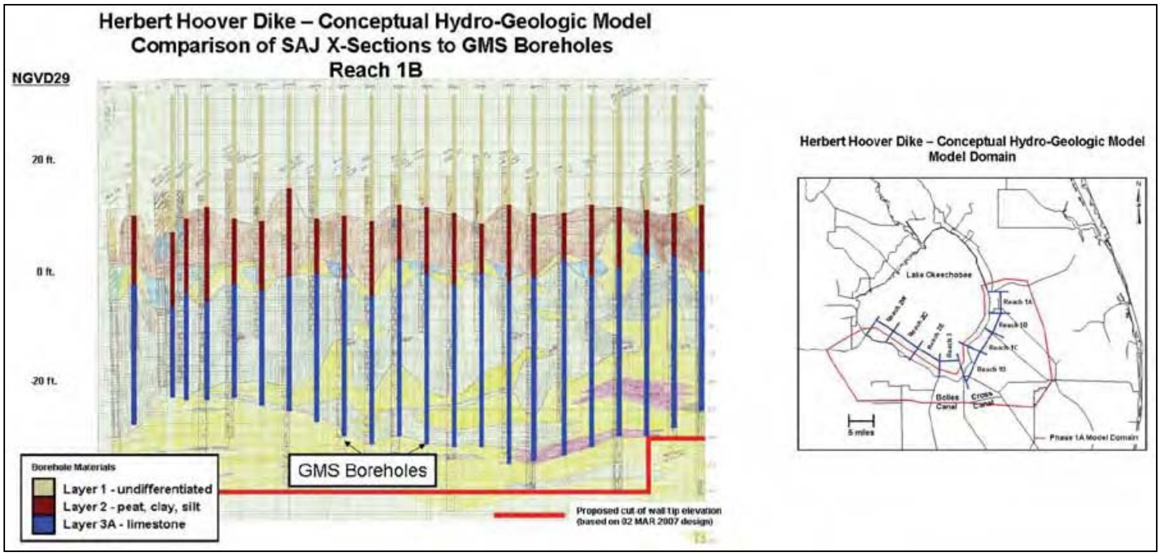

Figure 10. Comparison of SAJ cross-sections to GMS boreholes at Reach 1B of the HHD Phase 1A model.

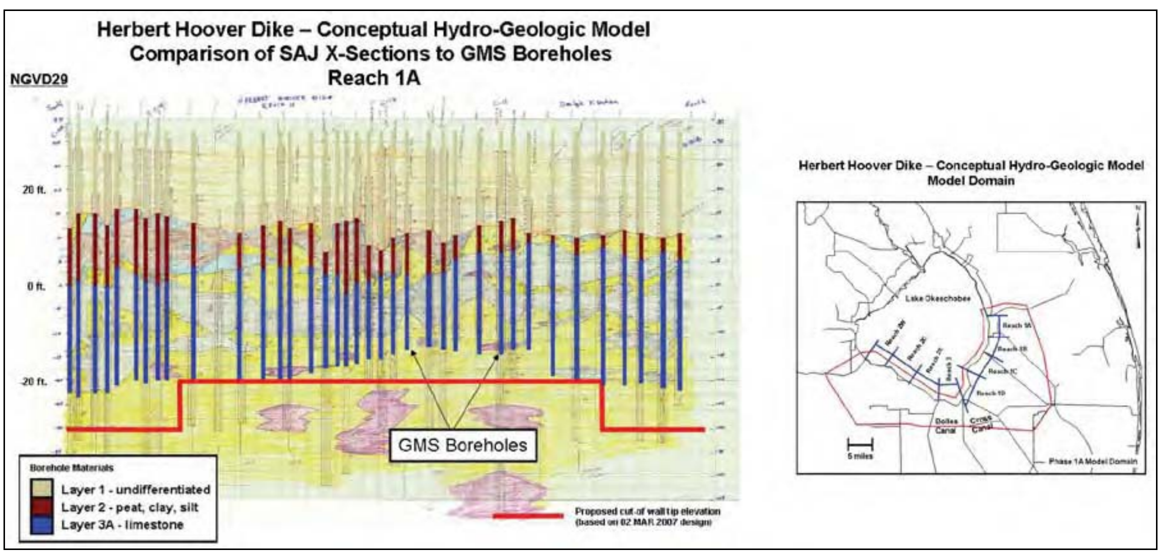

Figure 11. Comparison of SAJ cross-sections to GMS boreholes at Reach 1A of the HHD Phase 1A model.

Figure 12 shows the locations of selected borings used to generate cross-sections of the HHD Phase 1A conceptual model domain. Figures 13 through 17 show the cross sectional representation of the conceptual model compared to the REMER and dike alignment borings in the everglades agricultural area (EAA). Each figure shows a cross-section through the conceptual model solids developed to represent the geologic layers within the model domain. These figures also show the geologic layers, as classified by SAJ-EN-GG, at selected boring locations along the cross sectional alignment. Boring locations classified as “CB-HHD-...” correspond to dike alignment borings shown in Figures 4 through 11. The interfaces for each geologic unit were developed using the natural neighbor interpolation algorithm contained in GMS 6.0. The available data points from the REMER Hydro-geologic Framework and the dike alignment borings were used for the interpolation of each layer. The conceptual geologic representation in these figures shows a good general agreement with the observed geologic interfaces within the model domain. It is noted that several discrepancies exist between the boring logs and the final interpretation of the geology. Examples of this are at the Layer 2/3A/3B interface and the Layer 6/7 interface.

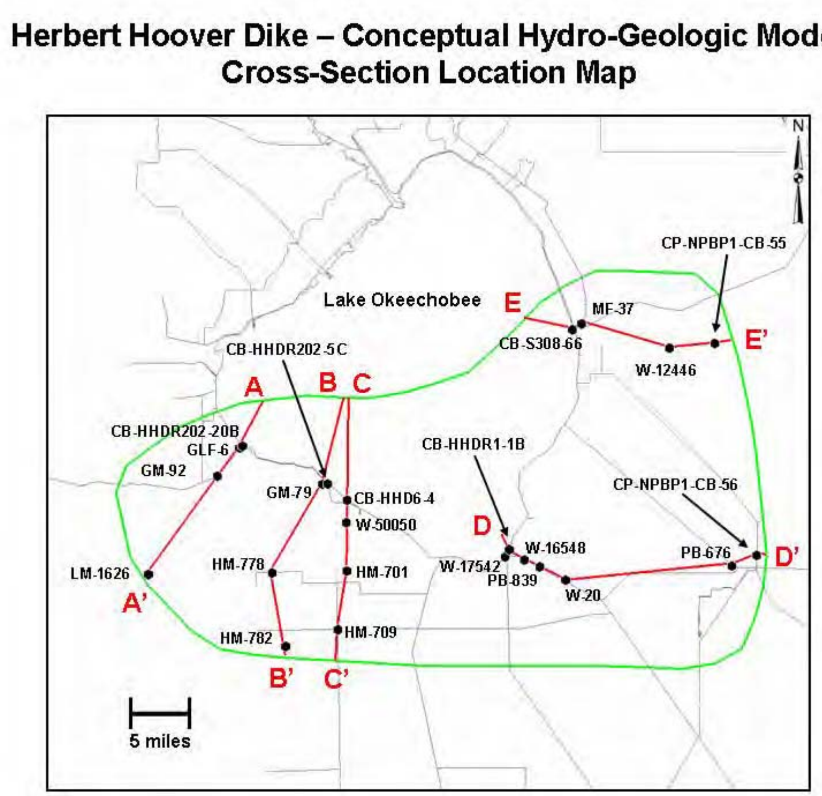

Figure 12. Five cross-sections selected to demonstrate the conceptual hydro-geologic model for HHD Phase 1A model.

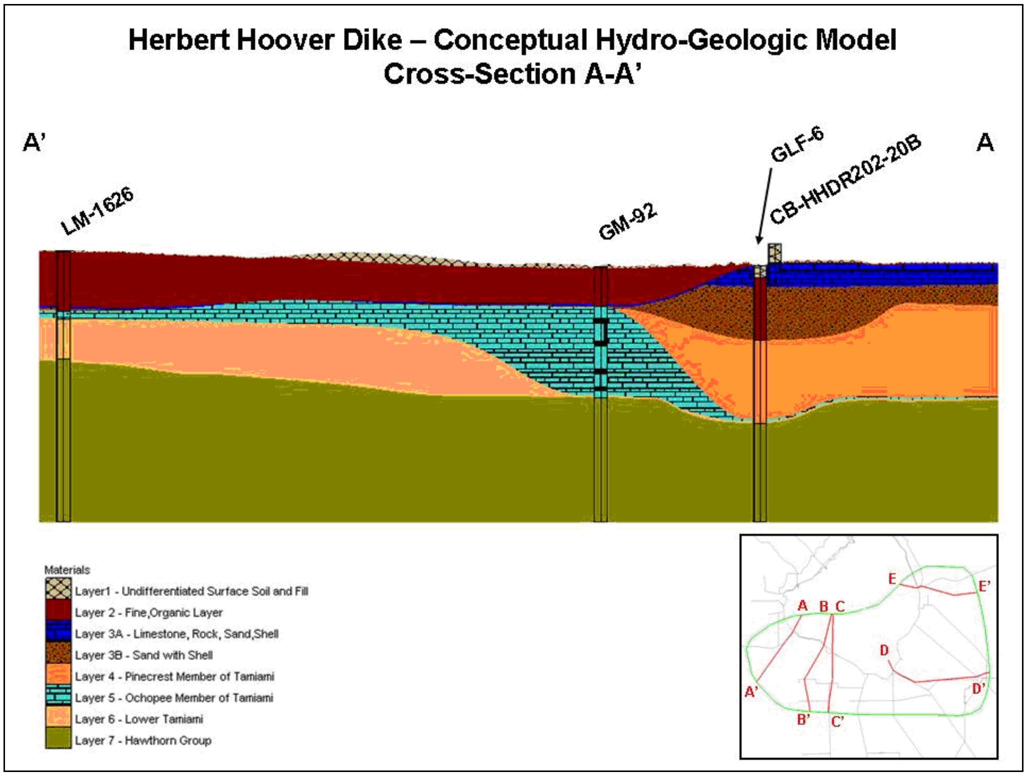

Figure 13. First cross-section (Cross-section AA') selected to demonstrate the conceptual hydro-geologic model for HHD Phase 1A model.

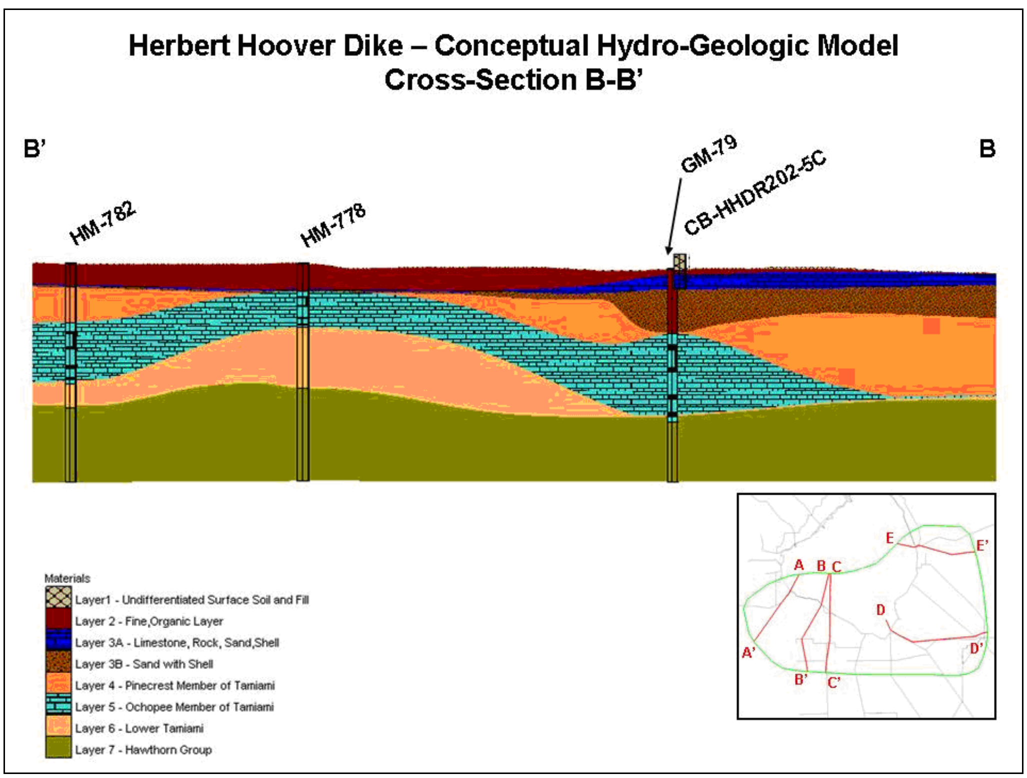

Figure 14. Second cross-section (Cross-section BB') selected to demonstrate the conceptual hydro-geologic model for HHD Phase 1A model.

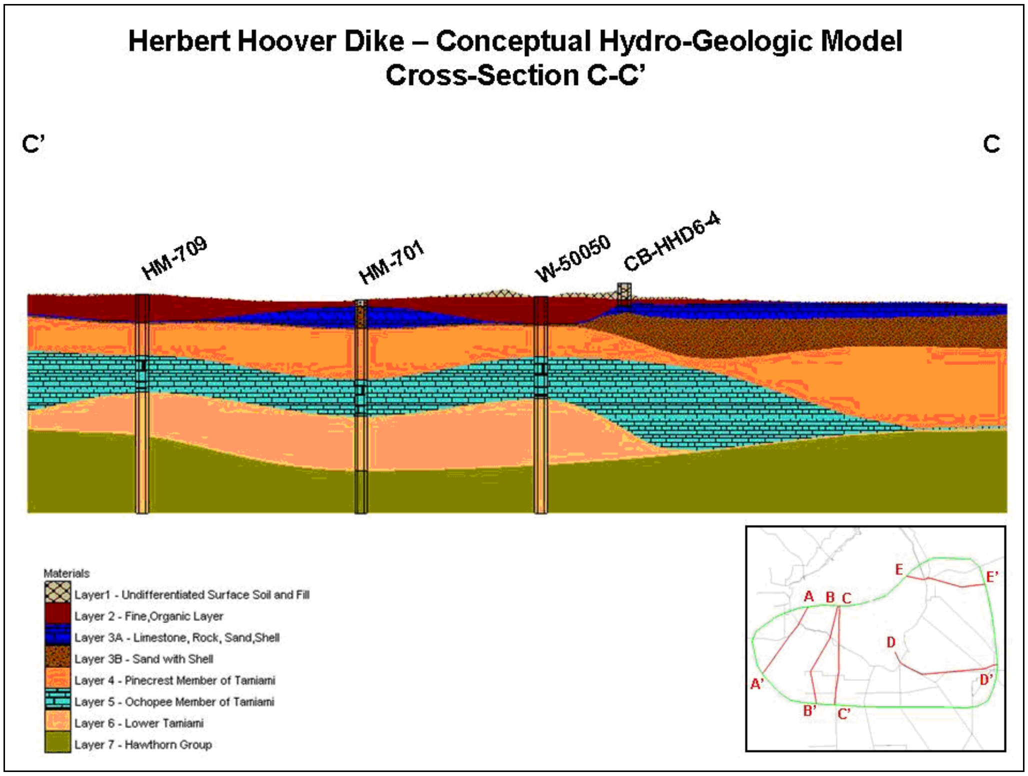

Figure 15. Third cross-section (Cross-section CC') selected to demonstrate the conceptual hydro-geologic model for HHD Phase 1A model.

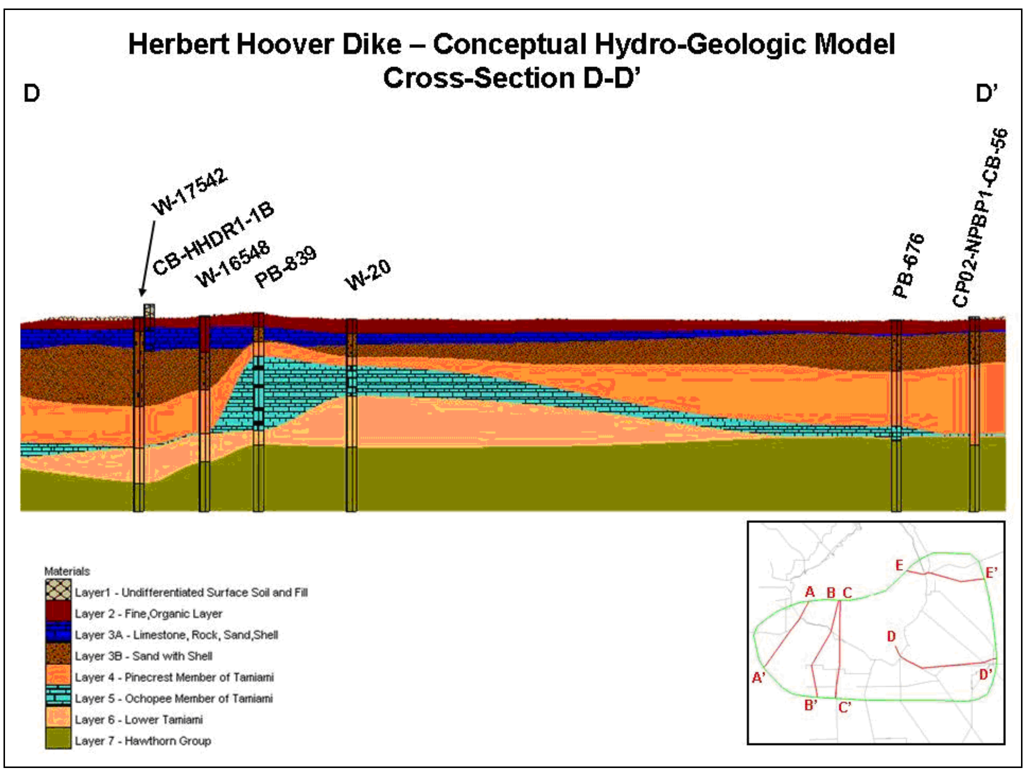

Figure 16. Fourth cross-section (Cross-section DD') selected to demonstrate the conceptual hydro-geologic model for HHD Phase 1A model.

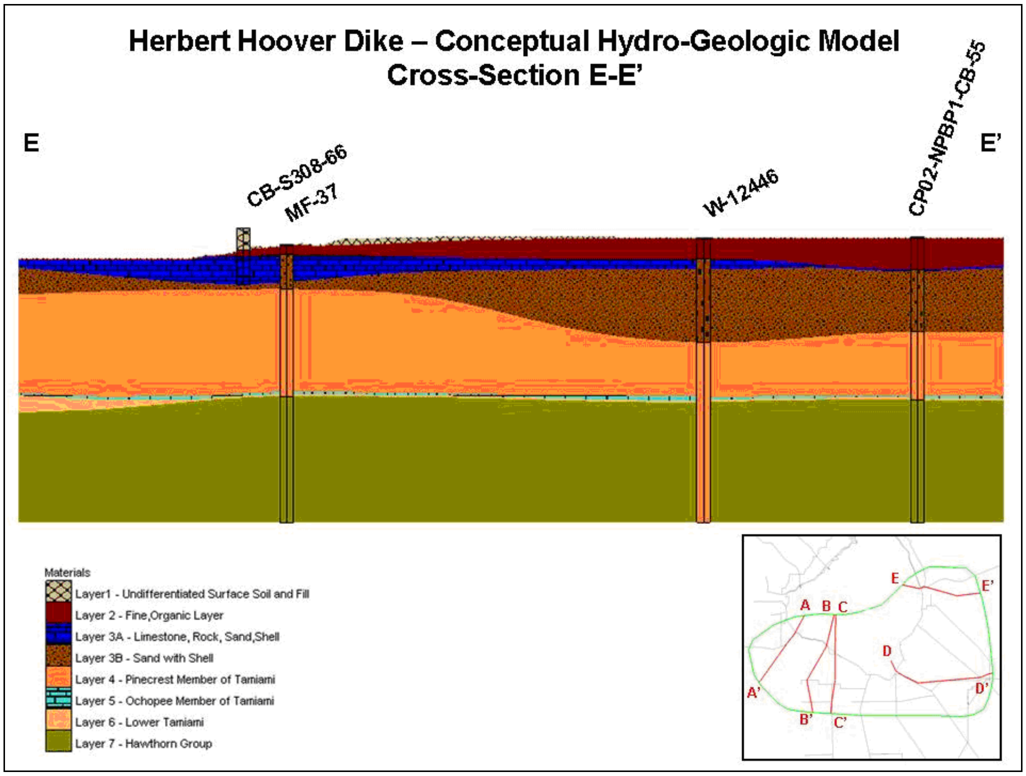

Figure 17. Fifth cross-section (Cross-section EE') selected to demonstrate the conceptual hydro-geologic model for HHD Phase 1A model.

These discrepancies are the result of differences in the details of available geologic logs. In areas where boreholes with a greater degree of detail are in close proximity to boreholes with a lesser degree of detail, such as along the HHD alignment, the geologic information in the borehole with the greater degree of detail controlled the geologic interpretation.

Figures 18 through 24 show the contours of the top of Layers 2 through 7, respectively. The contour interval in these figures is 5 ft. The boreholes plotted on each figure indicate locations where data was available for the geologic interpolation. Boreholes outside of the model domain were used by GMS 6.0 in the interpolation process. The top of the model was set using the topography described in the previous section, while the bottom of the model was set at a uniform elevation of -250 ft NGVD29. The conceptual model was extended into the Hawthorn Group, to allow WASH123D to simulate flow fields under the proposed cutoff wall in the event that the cutoff wall is extended to the Hawthorn Group in selected locations.

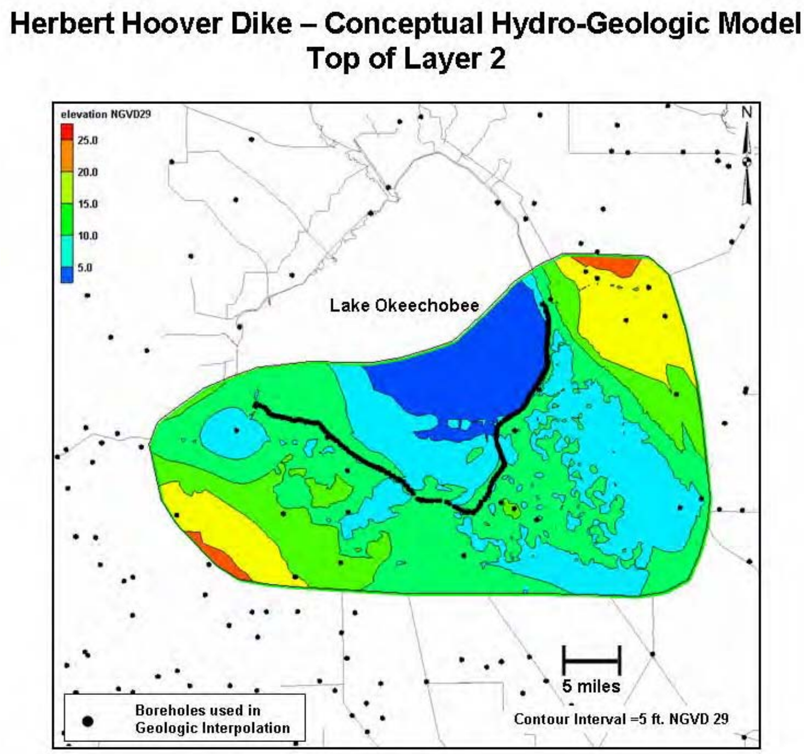

Figure 18. Surface elevation map for the top of Layer 2 of hydro-geologic model in HHD Phase 1A model.

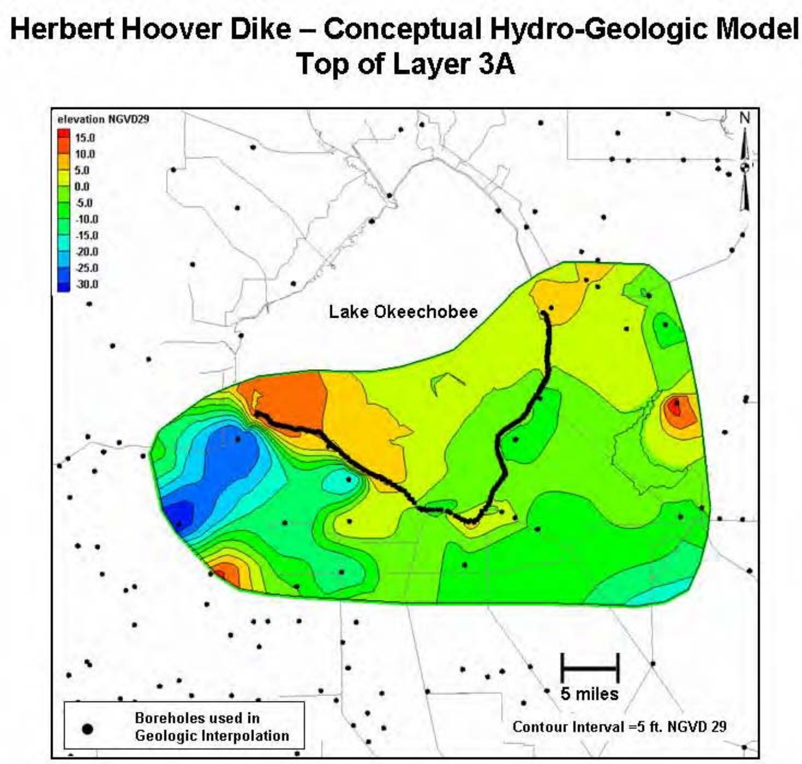

Figure 19. Surface elevation map for the top of Layer 3A of hydro-geologic model in HHD Phase 1A model.

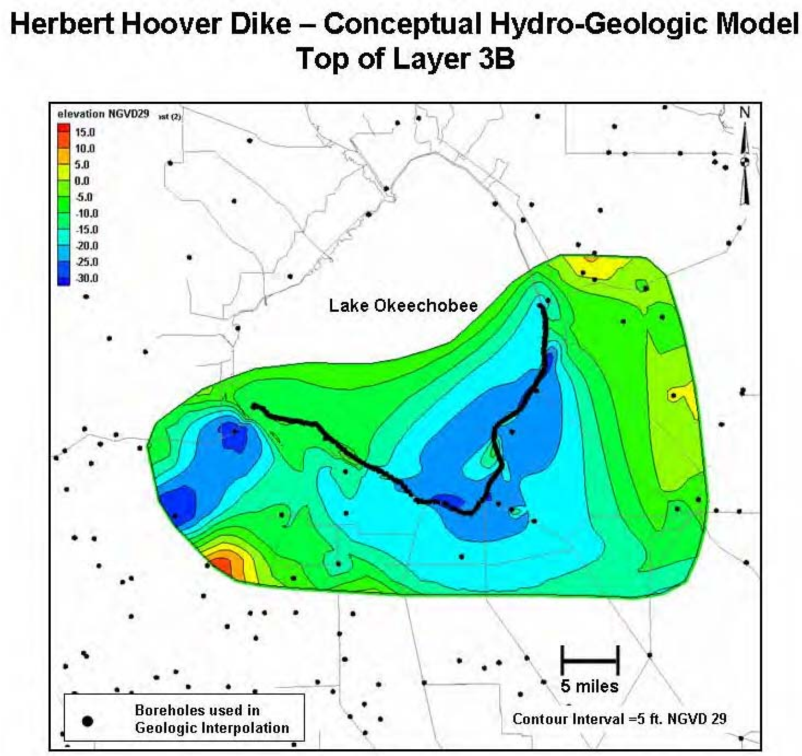

Figure 20. Surface elevation map for the top of Layer 3B of hydro-geologic model in HHD Phase 1A model.

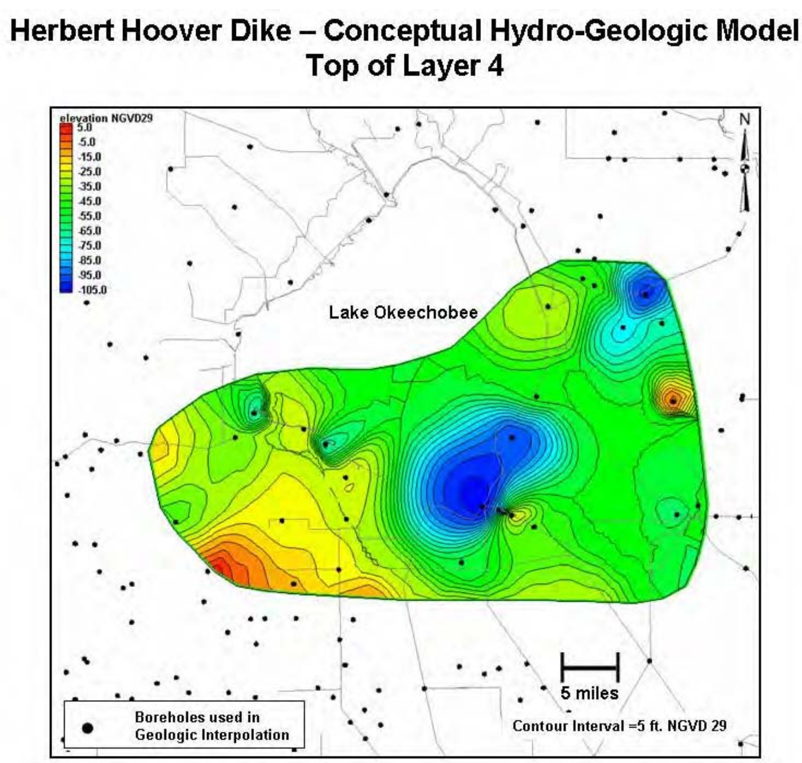

Figure 21. Surface elevation map for the top of Layer 4 of hydro-geologic model in HHD Phase 1A model.

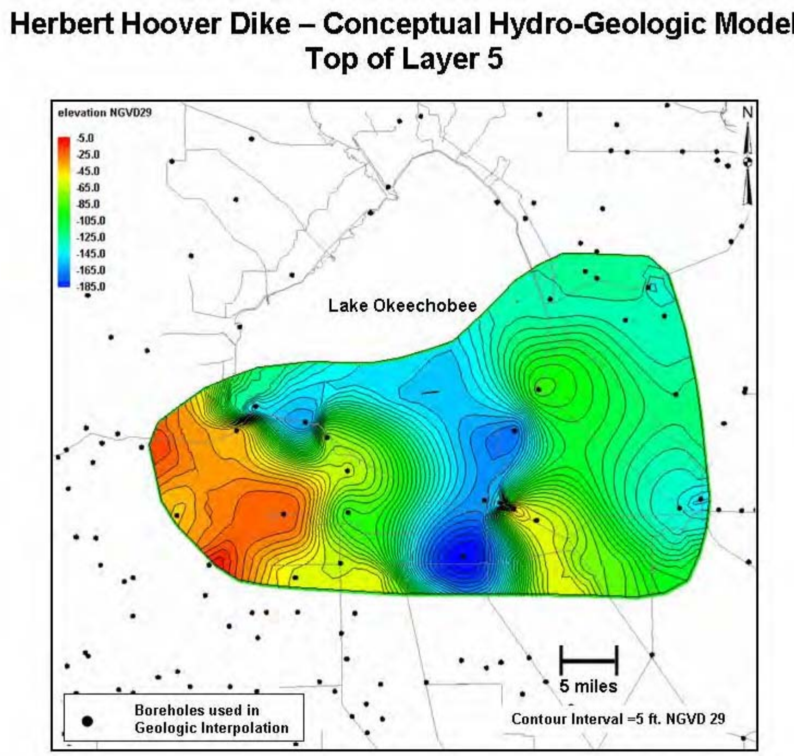

Figure 22. Surface elevation map for the top of Layer 5 of hydro-geologic model in HHD Phase 1A model.

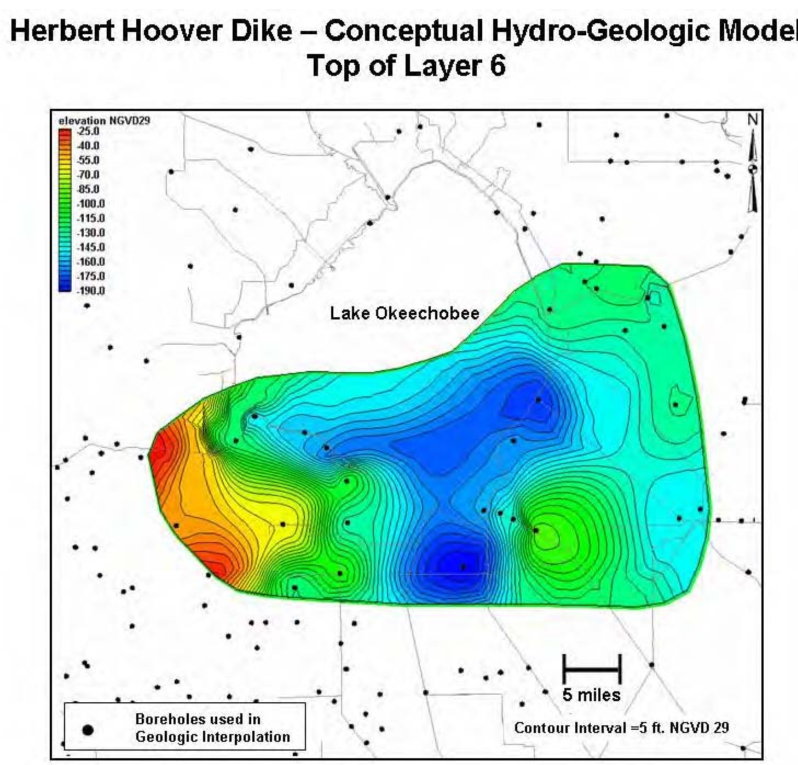

Figure 23. Surface elevation map for the top of Layer 6 of hydro-geologic model in HHD Phase 1A model.

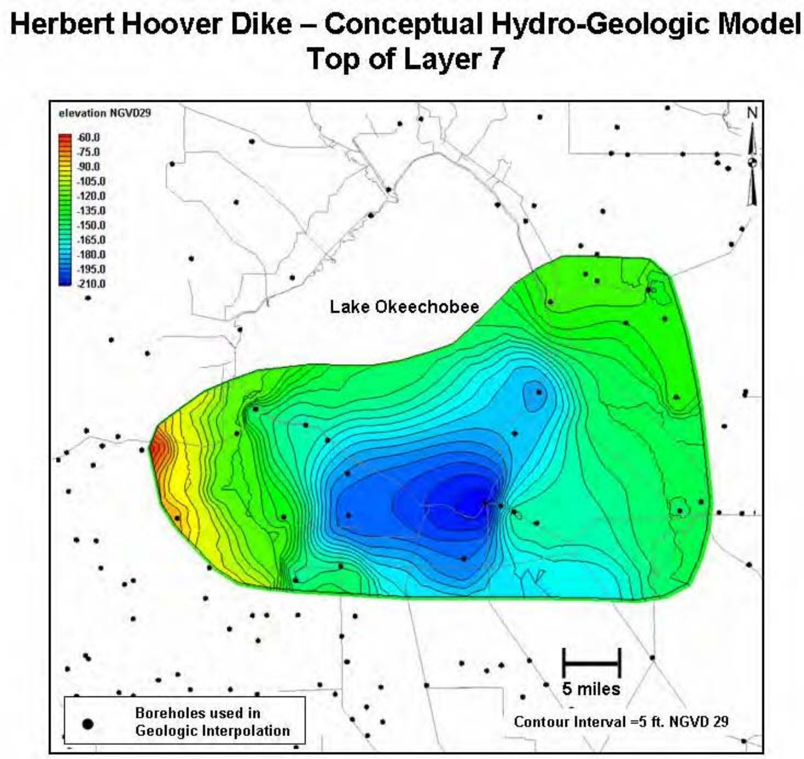

Figure 24. Surface elevation map for the top of Layer 7 of hydro-geologic model in HHD Phase 1A model.

Cutoff wall configuration

In the HHD Phase 1A modeling, one "With Project" scenario was studied. Based on discussions with SAJ-EN-GG on 08MAR07, the cutoff wall will have the configuration shown in Figure 25. This configuration has a revision date of 02MAR07. The tip elevation in this configuration varies between -15 and -40 ft NGVD29. This corresponds to approximate cutoff wall depths of between 47 and 72 ft, assuming that the cutoff wall is along the dike alignment and the top of the dike is approximately 32 ft NGVD29.

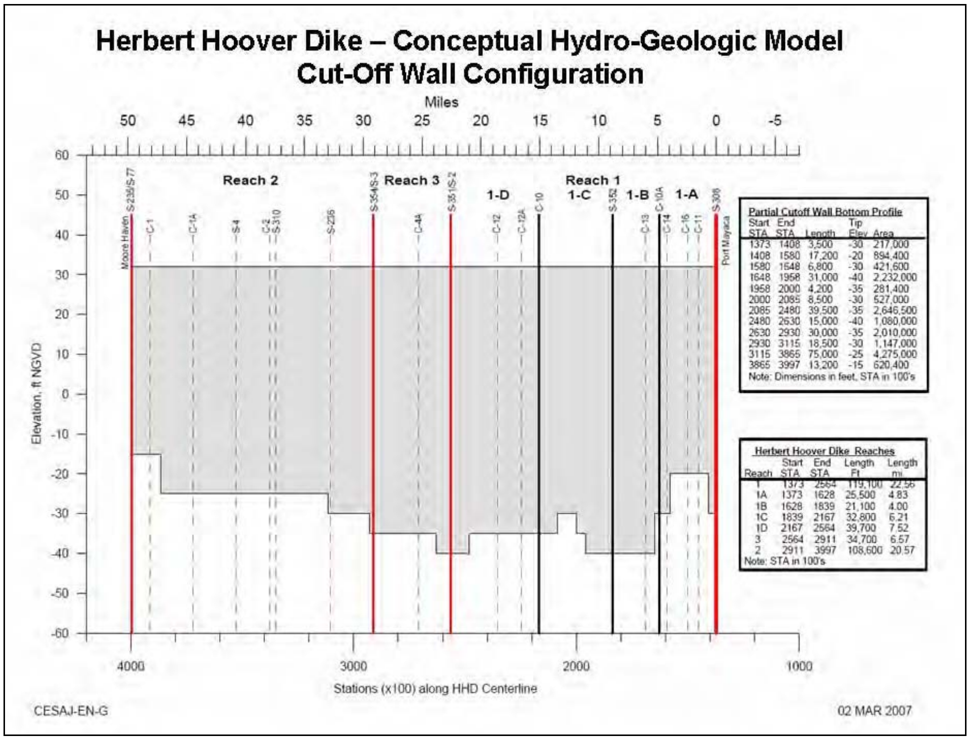

Figure 25. Cutoff wall configuration used in the HHD Phase 1A model.

Hydro-geological parameters

As the geologies were sorted into model layers, an analysis of the hydraulic conductivity of each layer was performed. Figures 26 through 33 illustrate the zones of different hydraulic conductivity within each layer. In total there were 11 subsurface materials, i.e., L1, L2-1, L2-2, L3A, L3B-1, L3B-2, L4, L5, L6, L7-1, and L7-2, incorporated into the HHD Phase 1A model for sensitivity analysis. The shaded polygons in these figures depict the regional extent of the hydraulic characteristics of the subsurface material. To determine reasonable ranges of hydraulic conductivity for each geologic layer, the hydraulic conductivity data contained in the MRRs, REMER Hydro-geologic Framework Report, and previous model studies were evaluated.

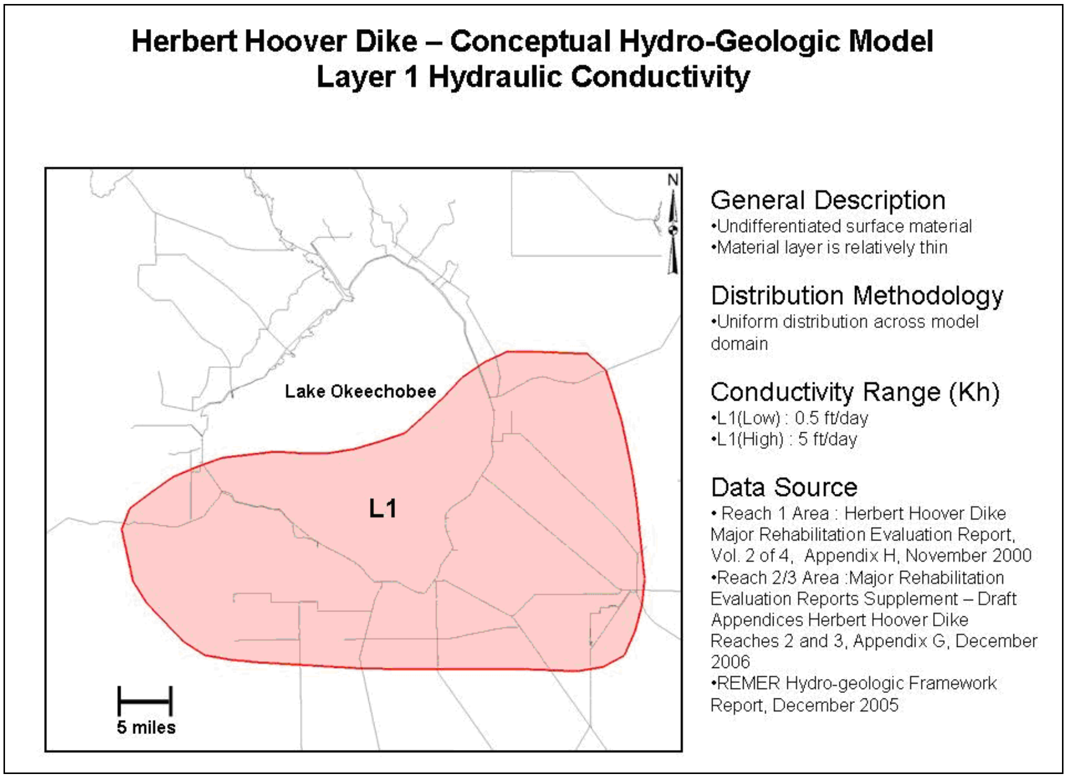

Figure 26. Hydraulic conductivity considered for Material L1 in the HHD Phase 1A model.

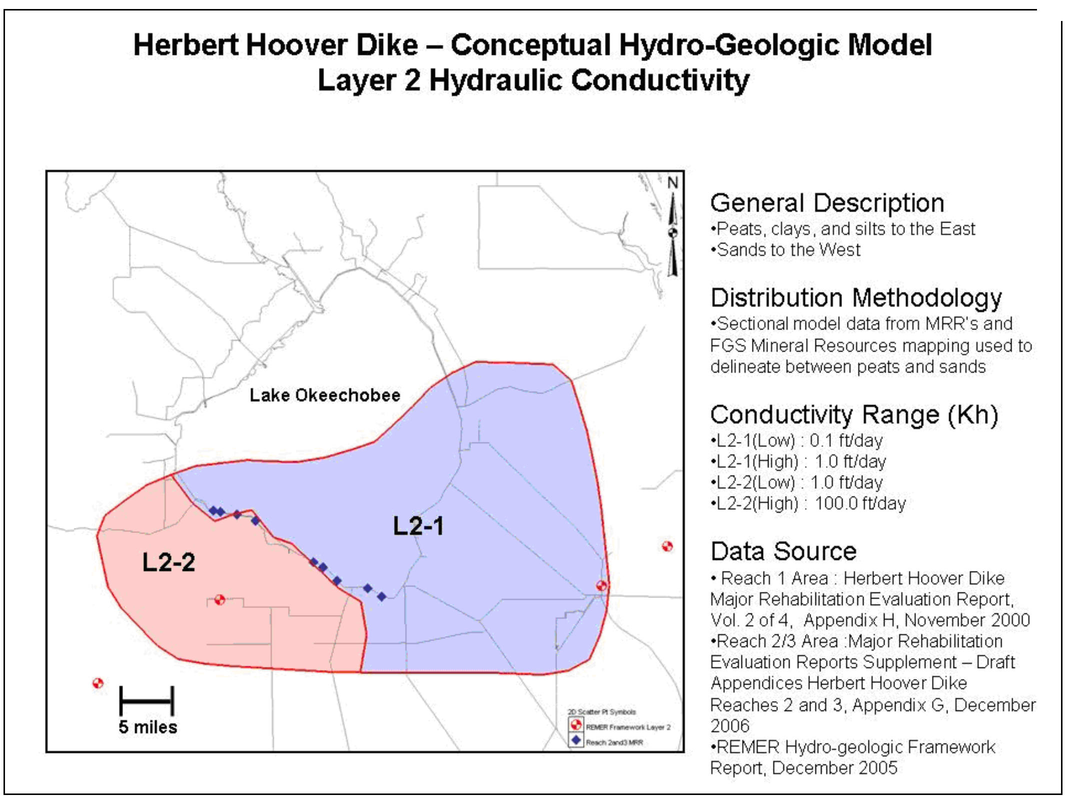

Figure 27. Hydraulic conductivity considered for Materials L2-1 and L2-2 in the HHD Phase 1A model.

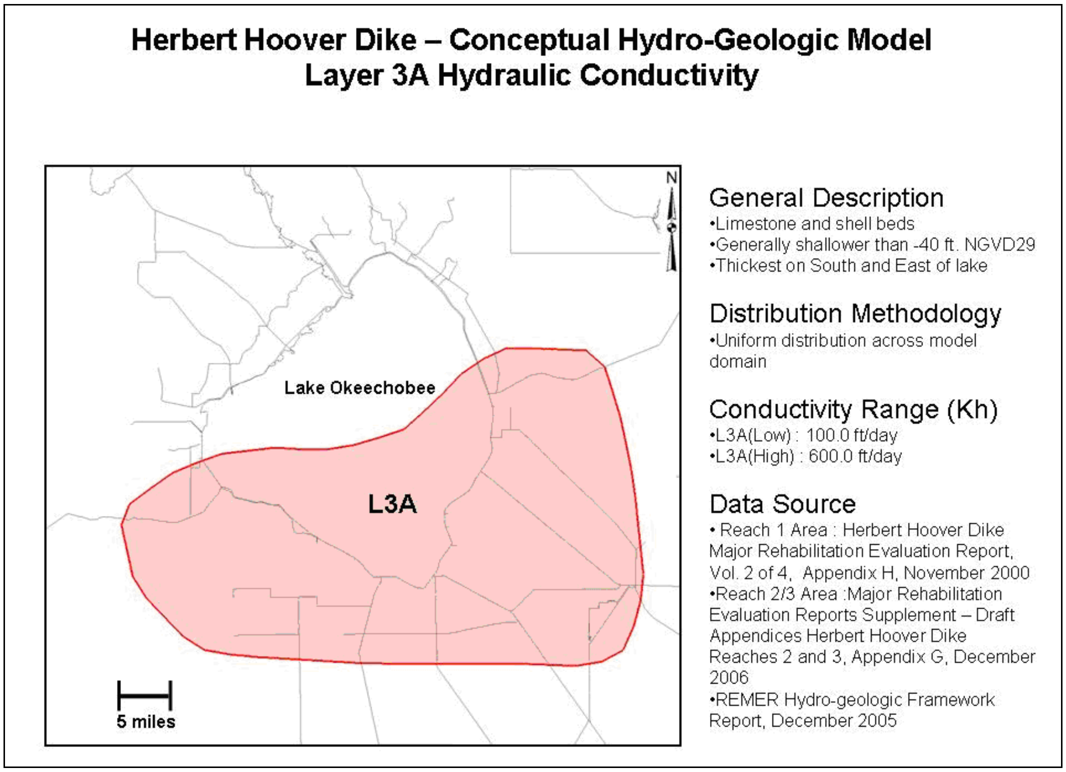

Figure 28. Hydraulic conductivity considered for Material L3A in the HHD Phase 1A model.

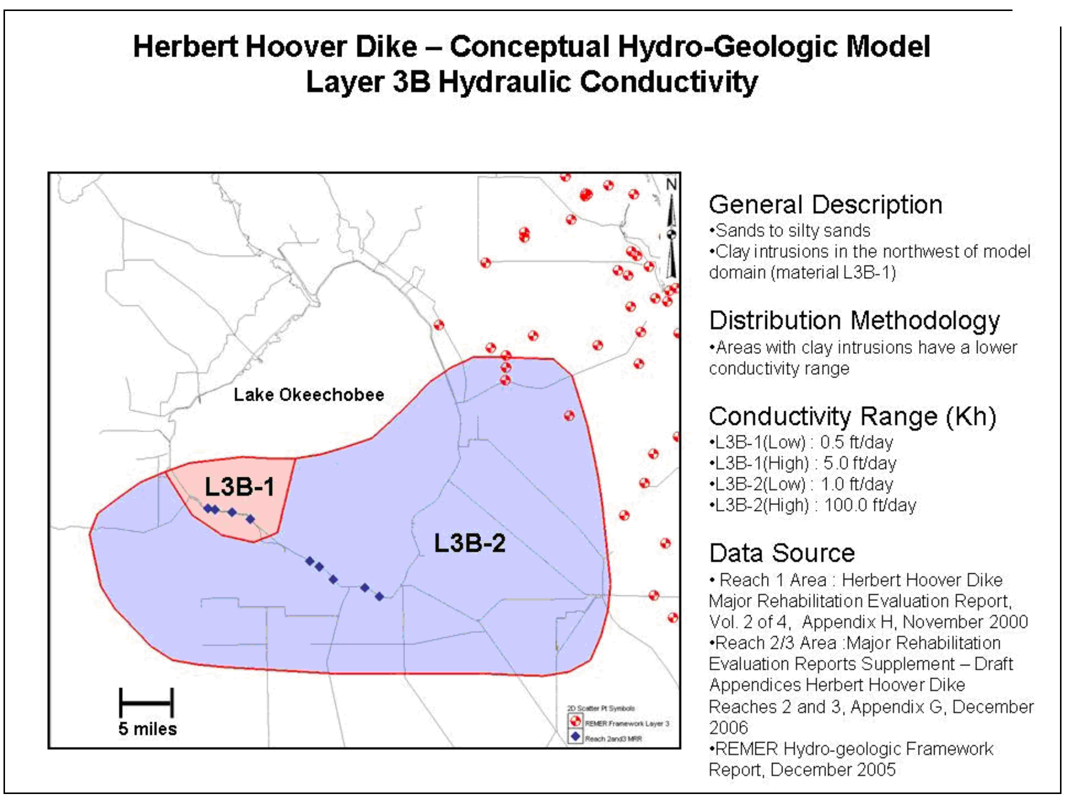

Figure 29. Hydraulic conductivity considered for Materials L3B-1 and L3B-2 in the HHD Phase 1A model.

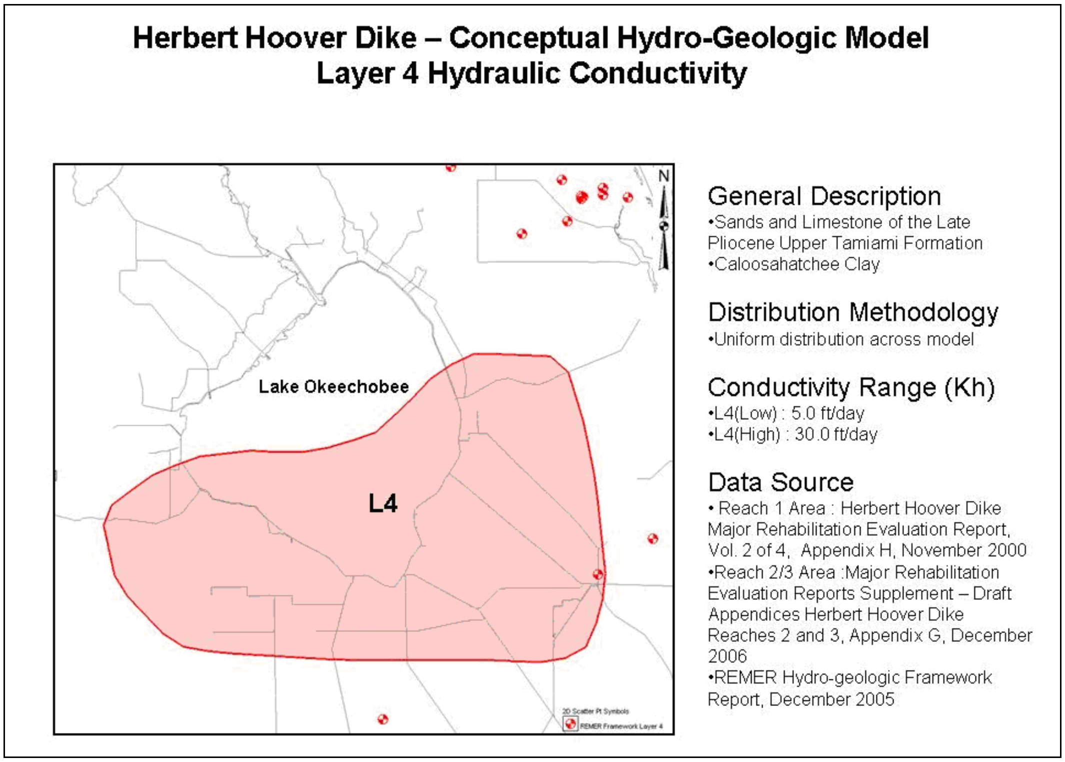

Figure 30. Hydraulic conductivity considered for Material L4 in the HHD Phase 1A model.

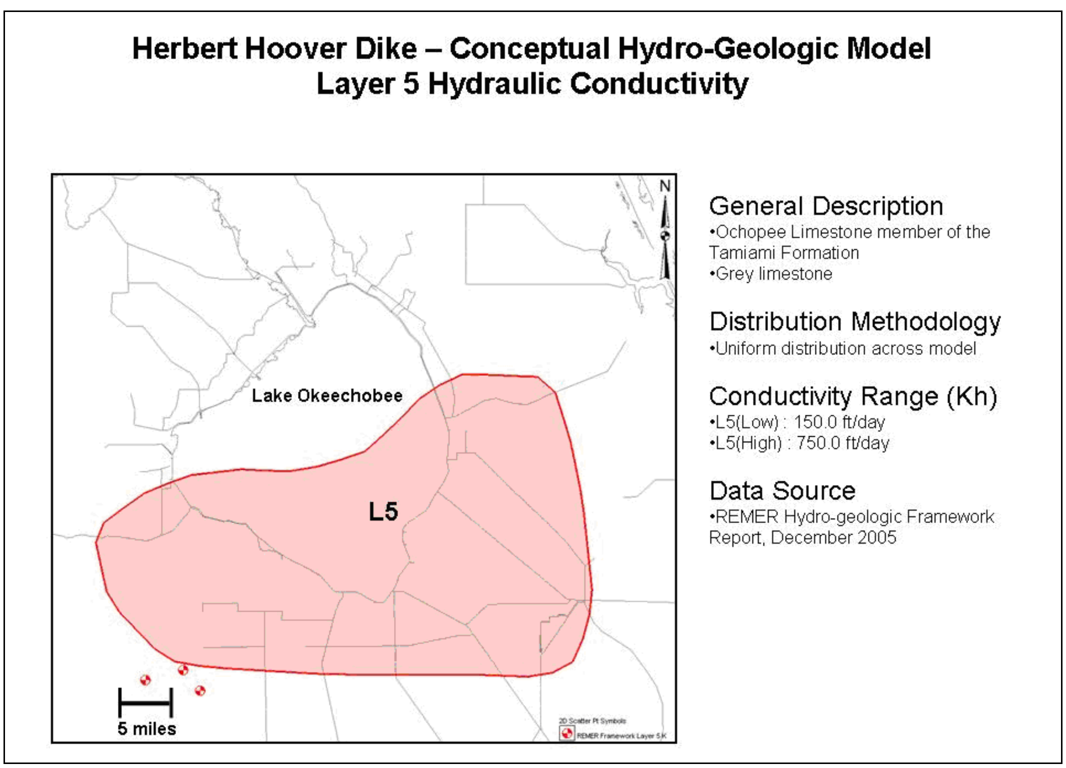

Figure 31. Hydraulic conductivity considered for Material L5 in the HHD Phase 1A model.

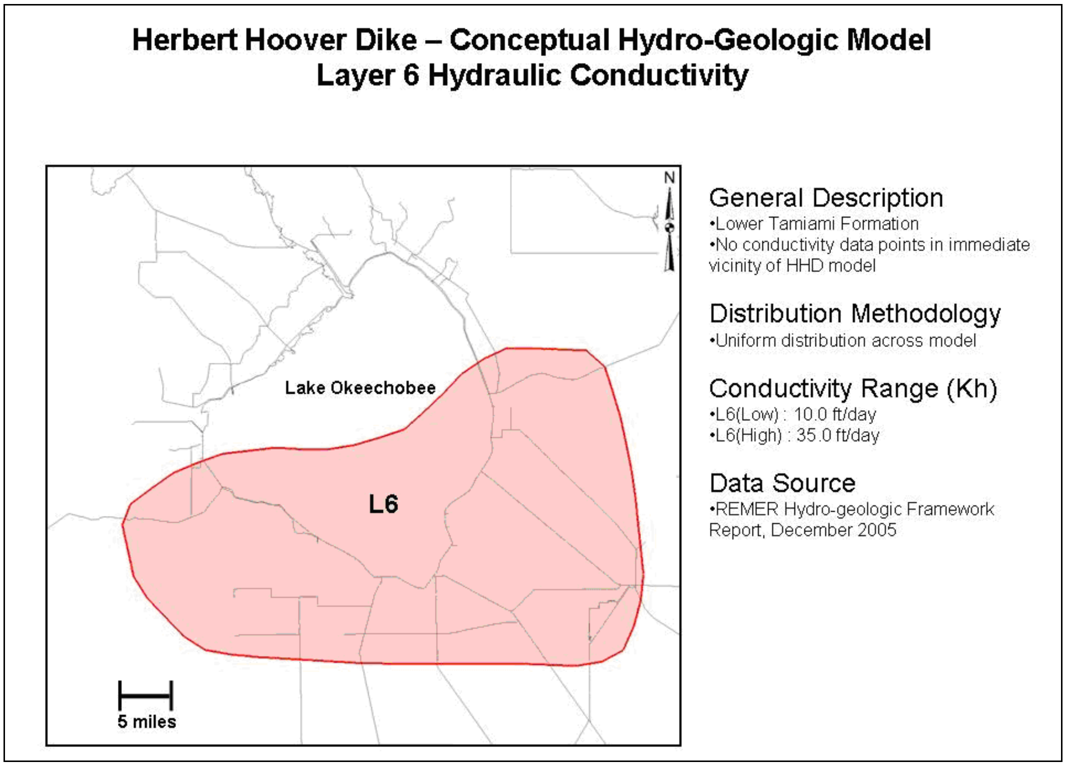

Figure 32. Hydraulic conductivity considered for Material L6 in the HHD Phase 1A model.

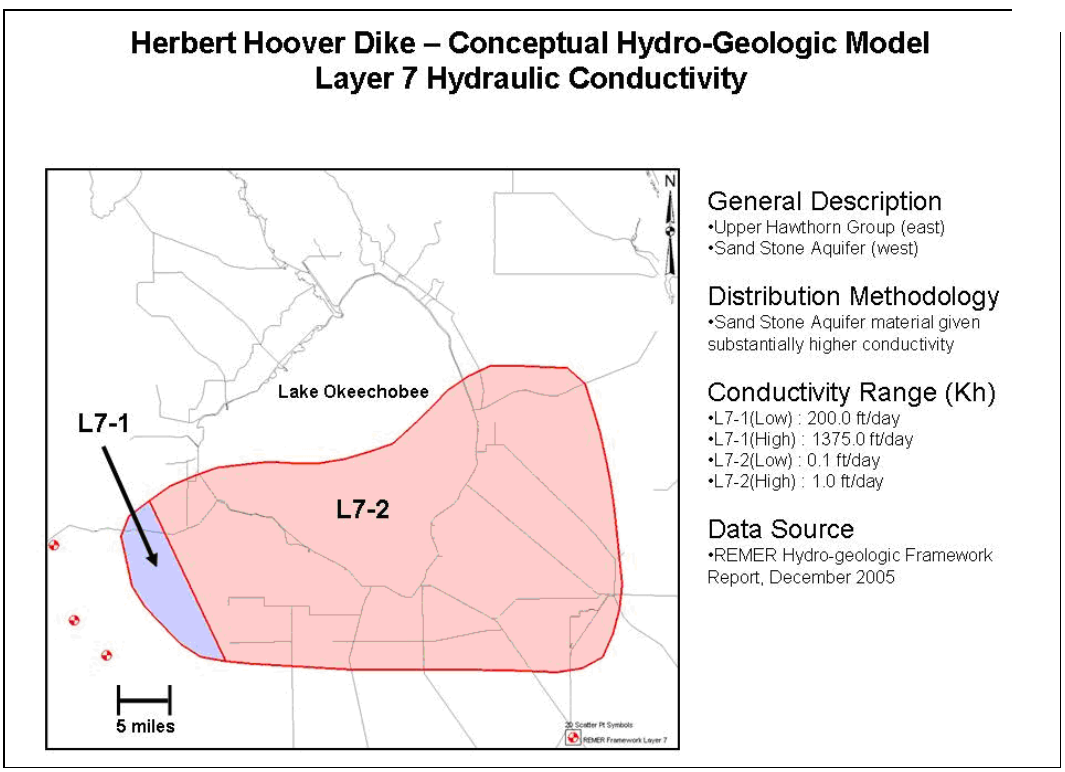

Figure 33. Hydraulic conductivity considered for Materials L7-1 and L7-2 in the HHD Phase 1A model.

Tables 1 through 3 summarize the available data provided by SAJ and used to determine the hydraulic conductivity ranges for the Phase 1A sensitivity analysis. The reports referenced in each table describe the methodology used to calculate the horizontal and vertical hydraulic conductivities of each material. If a range of conductivities was used in the referenced report, the high and low values of that range are shown in each table. The expected value was the median of the available data. The bottom line(s) of each table, included in red rectangles, identifies the selected range of hydraulic conductivity for the sensitivity analysis in this study, based on the available data.

Boundary groundwater well data

WASH123D uses Dirichlet, i.e., head-type, boundary conditions to specify total head for the 3-D subsurface flow calculations. For the HHD Phase 1A model, all side boundary nodes in the 3-D mesh will be assigned a total head boundary condition based on observed groundwater and lake stage data. Total head boundary conditions were used on the surface of the model to simulate canal and lake stages. Interpolated data from available surface water gages were used to assign these boundary conditions.

Because the HHD Phase 1A model is a steady-state flow model, the available period of record was evaluated to determine the long-term high, medium, and low water levels at each particular gage. These values were used in the HHD Phase 1A modeling to determine the order of magnitude of change in sub-regional groundwater flow from the "without project" to the "with project" scenario under a variety of hydrologic conditions. This section and the following two sections describe the groundwater data, the canal stage data, and the Lake Okeechobee stage data, respectively, accounted for in HHD Phase 1A modeling.

Figure 34 shows the location of groundwater wells in the vicinity of the model with more than five years of record. Locations marked in red have between five and ten years of data, while locations marked in blue have more than 10 years of data. Groundwater head data was downloaded from the DBHydro database maintained by South Florida Water Management District (SFWMD) for the entire period of record available for each gage. The following description for each gage summarizes the available information. For some gages multiple agencies collected data in the same location. As a result, multiple data sets are available at these locations. The historical data compiled at these groundwater head gages are plotted and given in Appendix E (Figures E1 through E13).

Table 1. Summary of available hydraulic conductivity data for Materials L1, L2-1, and L2-2 in the HHD Phase 1A model.

Layer 1 - Undiferentiated Sands/Embankment Fill

			High			Low			Expected			
Location	Reach	Material	Kh (ft/day)	K ratio (Kv/Kh)	Kv (ft/day)	Kh (ft/day)	K ratio (Kv/Kh)	Kv (ft/day)	Kh (ft/day)	K ratio (Kv/Kh)	Kv (ft/day)	Reference
Line 6	1	sand	4.680	1.000	4.680	0.886	1.000	0.886	2.030	1.000	2.030	Reach 1 MRR(NOV00), Page H8-12
STA 3866+00	2	fill	N/A	N/A	N/A	N/A	N/A	N/A	2.800	1.000	2.800	Reach 2/3 MRR(DEC06), Plate G-9
STA 3826+00	2	fill	N/A	N/A	N/A	N/A	N/A	N/A	2.800	1.000	2.800	Reach 2/3 MRR(DEC06), Plate G-11
STA 3726+00	2	fill	N/A	N/A	N/A	N/A	N/A	N/A	2.800	1.000	2.800	Reach 2/3 MRR(DEC06), Plate G-15
STA 3606+00	2	fill	N/A	N/A	N/A	N/A	N/A	N/A	2.800	1.000	2.800	Reach 2/3 MRR(DEC06), Plate G-18
STA 3188+00	2	fill	N/A	N/A	N/A	N/A	N/A	N/A	2.800	1.000	2.800	Reach 2/3 MRR(DEC06), Plate G-21
STA 3127+00	2	fill	N/A	N/A	N/A	N/A	N/A	N/A	2.800	1.000	2.800	Reach 2/3 MRR(DEC06), Plate G-24
STA 3016+00	2	fill	N/A	N/A	N/A	N/A	N/A	N/A	2.800	1.000	2.800	Reach 2/3 MRR(DEC06), Plate G-27
STA 2819+00	3	fill	N/A	N/A	N/A	N/A	N/A	N/A	2.850	1.000	2.850	Reach 2/3 MRR(DEC06), Plate G-32
STA 2723+00	3	fill	N/A	N/A	N/A	N/A	N/A	N/A	2.900	1.000	2.900	Reach 2/3 MRR(DEC06), Plate G-35
	REMER	undiferentiated		No specific value provided but noted as "generally low conductivity"								REMER Framework (DEC05), Page 9
Selected Range for HHD Model			5.0	1.0	5.0	0.5	1.0	0.5	2.8	1.0	2.8	

Layer 2 - Peats, Clays, Silts, Sands

			High			Low			Expected			
Location	Reach	Material	Kh (ft/day)	K ratio (Kv/Kh)	Kv (ft/day)	Kh (ft/day)	K ratio (Kv/Kh)	Kv (ft/day)	Kh (ft/day)	K ratio (Kv/Kh)	Kv (ft/day)	Reference
Line 6	1	peat	0.449	0.305	0.137	0.118	0.272	0.032	0.230	0.288	0.066	Reach 1 MRR(NOV00), Page H8-12
Line 6	1	silt/clay	0.327	0.797	0.261	0.102	0.394	0.040	0.183	0.560	0.102	Reach 1 MRR(NOV00), Page H8-12
STA 3866+00	2	silt/clay	N/A	N/A	N/A	N/A	N/A	N/A	0.22	0.73	0.161	Reach 2/3 MRR(DEC06), Plate G-9
STA 3826+00	2	peat	N/A	N/A	N/A	N/A	N/A	N/A	0.29	0.3	0.087	Reach 2/3 MRR(DEC06), Plate G-11
STA 3726+00	2	peat/silt/clay	N/A	N/A	N/A	N/A	N/A	N/A	Not present above limestone			Reach 2/3 MRR(DEC06), Plate G-15
STA 3606+00	2	peat/silt/clay	N/A	N/A	N/A	N/A	N/A	N/A	Not present above limestone			Reach 2/3 MRR(DEC06), Plate G-18
STA 3188+00	2	peat	N/A	N/A	N/A	N/A	N/A	N/A	0.29	0.3	0.087	Reach 2/3 MRR(DEC06), Plate G-21
STA 3188+00	2	clay	N/A	N/A	N/A	N/A	N/A	N/A	0.22	0.73	0.161	Reach 2/3 MRR(DEC06), Plate G-21
STA 3127+00	2	peat	N/A	N/A	N/A	N/A	N/A	N/A	0.29	0.3	0.087	Reach 2/3 MRR(DEC06), Plate G-24
STA 3016+00	2	peat	N/A	N/A	N/A	N/A	N/A	N/A	0.29	0.3	0.087	Reach 2/3 MRR(DEC06), Plate G-27
STA 2819+00	3	peat	N/A	N/A	N/A	N/A	N/A	N/A	0.29	0.3	0.087	Reach 2/3 MRR(DEC06), Plate G-32
STA 2723+00	3	peat	N/A	N/A	N/A	N/A	N/A	N/A	0.29	0.3	0.087	Reach 2/3 MRR(DEC06), Plate G-35
STA 2723+00	3	clay	N/A	N/A	N/A	N/A	N/A	N/A	0.22	0.73	0.161	Reach 2/3 MRR(DEC06), Plate G-35
STA 3866+00	2	shallow sand	N/A	N/A	N/A	N/A	N/A	N/A	10	1	10.000	Reach 2/3 MRR(DEC06), Plate G-9
STA 3826+00	2	shallow sand	N/A	N/A	N/A	N/A	N/A	N/A	10	1	10.000	Reach 2/3 MRR(DEC06), Plate G-11
STA 3726+00	2	shallow sand	N/A	N/A	N/A	N/A	N/A	N/A	10	1	10.000	Reach 2/3 MRR(DEC06), Plate G-15
STA 3606+00	2	shallow sand	N/A	N/A	N/A	N/A	N/A	N/A	10	1	10.000	Reach 2/3 MRR(DEC06), Plate G-18
STA 3188+00	2	shallow sand	N/A	N/A	N/A	N/A	N/A	N/A	Not present above limestone			Reach 2/3 MRR(DEC06), Plate G-21
STA 3127+00	2	shallow sand	N/A	N/A	N/A	N/A	N/A	N/A	Not present above limestone			Reach 2/3 MRR(DEC06), Plate G-24
STA 3016+00	2	shallow sand	N/A	N/A	N/A	N/A	N/A	N/A	Not present above limestone			Reach 2/3 MRR(DEC06), Plate G-27
STA 2819+00	3	shallow sand	N/A	N/A	N/A	N/A	N/A	N/A	10	1	10.000	Reach 2/3 MRR(DEC06), Plate G-32
STA 2723+00	3	shallow sand	N/A	N/A	N/A	N/A	N/A	N/A	10	1	10.000	Reach 2/3 MRR(DEC06), Plate G-35
West	REMER	shallow sand	N/A	N/A	N/A	N/A	N/A	N/A	93	N/A	N/A	REMER Framework (DEC05), database
East	REMER	peat/shallow sand	N/A	N/A	N/A	N/A	N/A	N/A	13	N/A	N/A	REMER Framework (DEC05), database
Selected Range for HHD Model (L2-1)			1.0	0.3	0.3	0.1	0.3	0.03	0.3	0.3	0.1	
Selected Range for HHD Model (L2-2)			100.0	1.0	100.0	1.0	1.0	1.0	10.0	1.0	10.0	

Table 2. Summary of available hydraulic conductivity data for Materials L3A, L3B-1, and L3B-2 in the HHD Phase 1A model.

Layer 3A - Limestone

			High			Low			Expected			
Location	Reach	Material	Kh (ft/day)	K ratio (Kv/Kh)	Kv (ft/day)	Kh (ft/day)	K ratio (Kv/Kh)	Kv (ft/day)	Kh (ft/day)	K ratio (Kv/Kh)	Kv (ft/day)	Reference
Line 6	1	rock	584.64	0.080	4.68E+01	110.736	0.080	8.856	254.88	0.080	20.304	Reach 1 MRR(NOV00), Page H8-12
various borings	1	limestone	210	N/A	N/A	1.44	N/A	N/A	N/A	N/A	N/A	Reach 1 MRR(NOV00), Page H4-13,14
STA 3866+00	2	sandy shell	N/A	N/A	N/A	N/A	N/A	N/A	600	1	600.000	Reach 2/3 MRR(DEC06), Plate G-9
STA 3866+00	2	limestone	N/A	N/A	N/A	N/A	N/A	N/A	360	0.08	28.800	Reach 2/3 MRR(DEC06), Plate G-9
STA 3826+00	2	sandy shell	N/A	N/A	N/A	N/A	N/A	N/A	600	1	600.000	Reach 2/3 MRR(DEC06), Plate G-11
STA 3726+00	2	limestone	N/A	N/A	N/A	N/A	N/A	N/A	360	0.08	28.800	Reach 2/3 MRR(DEC06), Plate G-15
STA 3726+00	2	sandy shell	N/A	N/A	N/A	N/A	N/A	N/A	605	1	605.000	Reach 2/3 MRR(DEC06), Plate G-15
STA 3606+00	2	limestone	N/A	N/A	N/A	N/A	N/A	N/A	360	0.08	28.800	Reach 2/3 MRR(DEC06), Plate G-18
STA 3188+00	2	limestone	N/A	N/A	N/A	N/A	N/A	N/A	360	0.08	28.800	Reach 2/3 MRR(DEC06), Plate G-21
STA 3127+00	2	limestone	N/A	N/A	N/A	N/A	N/A	N/A	360	0.08	28.800	Reach 2/3 MRR(DEC06), Plate G-24
STA 3016+00	2	limestone	N/A	N/A	N/A	N/A	N/A	N/A	360	0.08	28.800	Reach 2/3 MRR(DEC06), Plate G-27
STA 2819+00	3	limestone	N/A	N/A	N/A	N/A	N/A	N/A	360	0.08	28.800	Reach 2/3 MRR(DEC06), Plate G-32
STA 2723+00	3	limestone	N/A	N/A	N/A	N/A	N/A	N/A	360	0.08	28.800	Reach 2/3 MRR(DEC06), Plate G-35
EAA Model (COE)		caprock	N/A	N/A	N/A	N/A	N/A	N/A	100	0.1	10	Email from Samir Itani (9JUN05)
EAA Model (SEEP w/calib)		caprock	N/A	N/A	N/A	N/A	N/A	N/A	400	0.0025	1	Email from Samir Itani (9JUN05)
EAA Model (MODFLOW)		caprock	N/A	N/A	N/A	N/A	N/A	N/A	500	0.0022	1.1	Email from Samir Itani (9JUN05)
Selected Range for HHD Model			600.0	0.08	48.0	100.0	0.08	8.0	400.0	0.08	32.0	

Layer 3B - Sands

			High			Low			Expected			
Location	Reach	Material	Kh (ft/day)	K ratio (Kv/Kh)	Kv (ft/day)	Kh (ft/day)	K ratio (Kv/Kh)	Kv (ft/day)	Kh (ft/day)	K ratio (Kv/Kh)	Kv (ft/day)	Reference
Line 6	1	sand	4.680	1.000	4.680	0.886	1.000	0.886	2.030	1.000	2.030	Reach 1 MRR(NOV00), Page H8-12
STA 3866+00	2	sand	N/A	N/A	N/A	N/A	N/A	N/A	10	1	10.000	Reach 2/3 MRR(DEC06), Plate G-9
STA 3826+00	2	sand	N/A	N/A	N/A	N/A	N/A	N/A	10	1	10.000	Reach 2/3 MRR(DEC06), Plate G-11
STA 3826+00	2	clay	N/A	N/A	N/A	N/A	N/A	N/A	0.22	0.73	0.161	Reach 2/3 MRR(DEC06), Plate G-11
STA 3726+00	2	sand	N/A	N/A	N/A	N/A	N/A	N/A	10	1	10.000	Reach 2/3 MRR(DEC06), Plate G-15
STA 3726+00	2	clay	N/A	N/A	N/A	N/A	N/A	N/A	0.22	0.73	0.161	Reach 2/3 MRR(DEC06), Plate G-15
STA 3606+00	2	sand	N/A	N/A	N/A	N/A	N/A	N/A	10	1	10.000	Reach 2/3 MRR(DEC06), Plate G-18
STA 3188+00	2	sand	N/A	N/A	N/A	N/A	N/A	N/A	10	1	10.000	Reach 2/3 MRR(DEC06), Plate G-21
STA 3127+00	2	sand	N/A	N/A	N/A	N/A	N/A	N/A	10	1	10.000	Reach 2/3 MRR(DEC06), Plate G-24
STA 3016+00	2	sand	N/A	N/A	N/A	N/A	N/A	N/A	10	1	10.000	Reach 2/3 MRR(DEC06), Plate G-27
STA 2819+00	3	sand	N/A	N/A	N/A	N/A	N/A	N/A	10	1	10.000	Reach 2/3 MRR(DEC06), Plate G-32
STA 2723+00	3	sand	N/A	N/A	N/A	N/A	N/A	N/A	10	1	10.000	Reach 2/3 MRR(DEC06), Plate G-35
East	REMER	sand	73	N/A	N/A	14	N/A	N/A	N/A	N/A	N/A	REMER Framework (DEC05), database
EAA Model (COE)		Ft. Thompson	N/A	N/A	N/A	N/A	N/A	N/A	60	0.417	25	Email from Samir Itani (9JUN05)
EAA Model (SEEP w/calib)		Ft. Thompson	N/A	N/A	N/A	N/A	N/A	N/A	1000	0.004	4	Email from Samir Itani (9JUN05)
EAA Model (MODFLOW)		Ft. Thompson	N/A	N/A	N/A	N/A	N/A	N/A	400	0.025	10	Email from Samir Itani (9JUN05)
Selected Range for HHD Model (L3B-1)			5.0	0.8	4.0	0.5	0.8	0.4	1.0	0.8	0.8	
Selected Range for HHD Model (L3B-2)			100.0	1.0	100.0	1.0	1.0	1.0	10.0	1.0	10.0	

Table 3. Summary of available hydraulic conductivity data for Materials L4, L5, L6, L7-1, and L7-2 in the HHD Phase 1A model.

Layer 4 - Sands

			High			Low			Expected			
Location	Reach	Material	Kh (ft/day)	K ratio (Kv/Kh)	Kv (ft/day)	Kh (ft/day)	K ratio (Kv/Kh)	Kv (ft/day)	Kh (ft/day)	K ratio (Kv/Kh)	Kv (ft/day)	Reference
Line 6	1	sand	4.680	1.000	4.680	0.886	1.000	0.886	2.030	1.000	2.030	Reach 1 MRR(NOV00), Page H8-12
All Stations	2/3	sand	N/A	N/A	N/A	N/A	N/A	N/A	10	1	10.000	Reach 2/3 MRR(DEC06), Plate G-9 to 35
East	REMER	sand	37	N/A	N/A	15	N/A	N/A	N/A	N/A	N/A	REMER Framework (DEC05), database
Selected Range for HHD Model			30.0	0.1	3.0	5.0	0.1	0.5	10.0	0.1	1.0	

Layer 5 - Limestone

			High			Low			Expected			
Location	Reach	Material	Kh (ft/day)	K ratio (Kv/Kh)	Kv (ft/day)	Kh (ft/day)	K ratio (Kv/Kh)	Kv (ft/day)	Kh (ft/day)	K ratio (Kv/Kh)	Kv (ft/day)	Reference
Line 6	1	sand	4.680	1.000	4.680	0.886	1.000	0.886	2.030	1.000	2.030	Reach 1 MRR(NOV00), Page H8-12
All Stations	2/3	sand	N/A	N/A	N/A	N/A	N/A	N/A	10	1	10.000	Reach 2/3 MRR(DEC06), Plate G-9 to 35
Southwest	REMER	limestone	730	N/A	N/A	151	N/A	N/A	N/A	N/A	N/A	REMER Framework (DEC05), database
Selected Range for HHD Model			750.0	0.08	60.0	150.0	0.08	12.0	400.0	0.08	32.0	

Layer 6 - Sands

			High			Low			Expected			
Location	Reach	Material	Kh (ft/day)	K ratio (Kv/Kh)	Kv (ft/day)	Kh (ft/day)	K ratio (Kv/Kh)	Kv (ft/day)	Kh (ft/day)	K ratio (Kv/Kh)	Kv (ft/day)	Reference
Line 6	1	sand	4.680	1.000	4.680	0.886	1.000	0.886	2.030	1.000	2.030	Reach 1 MRR(NOV00), Page H8-12
All Stations	2/3	sand	N/A	N/A	N/A	N/A	N/A	N/A	10	1	10.000	Reach 2/3 MRR(DEC06), Plate G-9 to 35
South	REMER	sand	33	N/A	N/A	0.01	N/A	N/A	N/A	N/A	N/A	REMER Framework (DEC05), database
EAA Model (COE)		Tamiami	N/A	N/A	N/A	N/A	N/A	N/A	36.000	0.500	18.000	Email from Samir Itani (9JUN05)
EAA Model (SEEP w/calib)		Tamiami	N/A	N/A	N/A	N/A	N/A	N/A	300	0.003	1.000	Email from Samir Itani (9JUN05)
EAA Model (MODFLOW)		Tamiami	N/A	N/A	N/A	N/A	N/A	N/A	36.000	0.500	18.000	Email from Samir Itani (9JUN05)
Selected Range for HHD Model			35.0	0.5	17.5	10.0	0.5	5.0	35.0	0.5	17.5	

Layer 7 - Hawthorn Group/Sand Stone Aquifer

			High			Low			Expected			
Location	Reach	Material	Kh (ft/day)	K ratio (Kv/Kh)	Kv (ft/day)	Kh (ft/day)	K ratio (Kv/Kh)	Kv (ft/day)	Kh (ft/day)	K ratio (Kv/Kh)	Kv (ft/day)	Reference
East	REMER	Sand Stone Aq.	1375	N/A	N/A	200	N/A	N/A	N/A	N/A	N/A	REMER Framework (DEC05), database
Selected Range for HHD Model (L7-1)			1375.0	0.1	137.5	200.0	0.1	20.0	500.0	0.1	50.0	
Selected Range for HHD Model (L7-2)			1.0	0.3	0.3	0.1	0.3	0.03	0.3	0.3	0.09	Assumed values similar to Clay in Layer 2

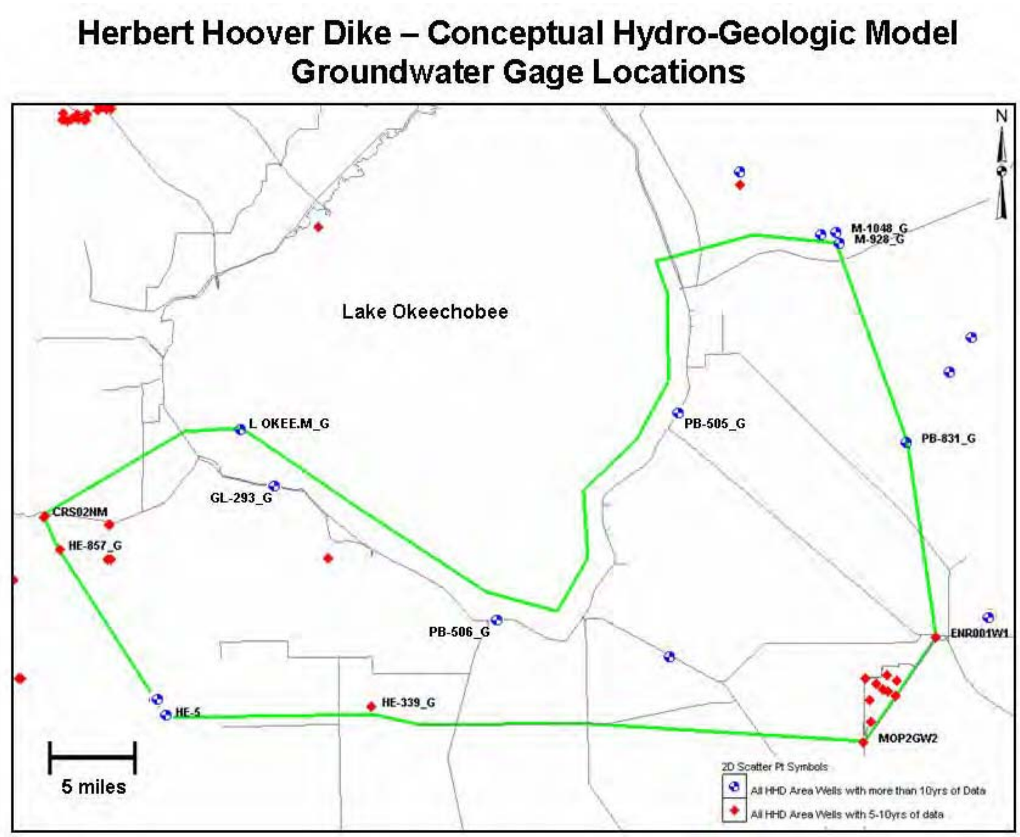

Figure 34. Groundwater head gage locations considered in the HHD Phase 1A model.

HE-5: This gage is located in Hendry County in the southwestern portion of the HHD Phase 1A model domain. The well has a total depth of 13 ft and is screened at a depth of 8.7 to 13 ft. Two data sets exist in DBHydro for this gage. Figure E1 shows the recorded water level for these data sets. The maximum data set value is 26.51 ft NGVD29 and the minimum data set value is 22.25 ft NGVD29.

HE-339_G: This gage is located in Hendry County in the southern potion of the HHD Phase 1A model domain. The well has a total depth of 13 ft and is screened at a depth of 11 to 13 ft. Three data sets exist in DBHydro for this gage. The data set collected between 5APR64 and 30SEP73 appears to be significantly lower than the data collected in subsequent years. According to SAJ-EN-GG, this discrepancy may be due to survey elevation corrections with modern technology or the conversions from Price Stage Flow Meters with pen & ink instrument-tation to radio control telemetry systems. Because this data appears to be suspect, it was not used in defining the model boundary conditions. Figure E2 shows the recorded water level for the remaining two data sets. For these two data sets, the maximum data set value is 15.11 ft NGVD29 and the minimum data set value is 10.76 ft NGVD29.

MOP2GW1, MOP2GW2, and MOP2GW3: This gage cluster is located in Palm Beach County at the southern end of STA1W in the south-eastern potion of the HHD Phase 1A model domain. The three wells in this cluster are in essentially the same horizontal location and have varying depths. MOP2GW1 is the deepest and is screened at a depth of 99.65 to 101.65 ft. MOP2GW3 is the shallowest and is screened at a depth of 29.5 to 31.5 ft. MOP2GW2 is screened at a depth of 57.26 to 59.26 ft., between the other two wells in the cluster. Figure E3 shows the recorded water level for these wells. Generally, the data shows a slight downward gradient in this area, with the water level in the shallower well being 0.2 ft higher than the deeper well on average. This may be the result of water level fluctuations in the adjacent storm treatment area. Although this downward gradient does increase at times to approximately 0.5 ft for the purposes of this Phase 1A model the water levels in this location was treated as hydrostatic. For these three wells, the maximum data set value is 14.59 ft NGVD29 and the minimum data set value is 9.4 ft NGVD29.

ENR001W1 and ENR001W2: This gage cluster is located in Palm Beach County at the northern end of WCA1. The two wells in this cluster are in essentially the same horizontal location and have varying depths. ENR001W1 is the deeper well and is screened at a depth of 101.1 to 102.1 ft. ENR001W2 is the shallower well and is screened at a depth of 62.97 to 64.97 ft. Figure E4 shows the recorded water level for these wells. Generally, the data shows a slight downward gradient in this area, with the water level in the shallower well being less than 0.1 ft higher than the deeper well on average. Although this downward gradient does increase at times to approximately 0.89 ft for a short period of time, for the purposes of this Phase 1A model the water levels in this location was treated as hydrostatic. For these two wells, the maximum data set value is 12.37 ft NGVD29 and the minimum data set value is 8.73 ft NGVD29.

PB-831_G: This gage is located in Palm Beach County in the eastern potion of the HHD Phase 1A model domain. The well has a total depth of 25 ft and is screened at a depth of 21 to 25 ft. Two data sets exist in DBHydro for this gage. Figure E5 shows the recorded water level for these data sets. The data sets appear to be consistent with one another, with the maximum data set value is 23.69 ft NGVD29 and the minimum data set value is 18.53 ft NGVD29.

M-1048_G and M-928_G: These gages are located in Martin County at the northeastern potion of the HHD Phase 1A model domain. These two wells are located horizontally within 100 ft of one another but have varying depths. M-1048_G appears to be the deeper well and is screened at a depth of 25 to 80 ft. M-928_G appears to be the shallower well with a total depth of 11 ft. Figures E6 and E7 show the recorded water level for these wells, respectively. The periods of record for these wells only overlap between 25SEP74 and 27APR77. The data from these two wells during that period appear to be relatively consistent. Consequently, the water level in this area was treated as hydrostatic. For M-1048_G, the maximum data set value is 34.05 ft NGVD29 and the minimum data set value is 24.65 ft. NGVD29. For M-928_G, the maximum data set value is 33.35 ft NGVD29 and the minimum data set value is 20.7 ft NGVD29.

CRS02FM, CRS02FS, CRS02NM and CRS02NS: This gage cluster is located in Glades County in the vicinity of Lake Hicpochee in the northwestern potion of the HHD Phase 1A model domain. The four wells are installed in clusters of two, which are approximately 350 ft apart from each another. Each well pair has varying depths. The CRS02NM and CRS02NS well pair is approximately 300 ft south of the Caloosahatchee River. CRS02NM is the deeper well of the pair and is screened at a depth of 54.01 to 59.01 ft. CRS02NS is the shallower well of the pair and is screened at a depth of 17.4 to 22.4 ft. The CRS02FM and CRS02FS well pair is approximately 650 ft south of the Caloosahatchee River. CRS02FM is the deeper well of the pair and is screened at a depth of 38.45 to 43.45 ft. CRS02FS is the shallower well of the pair and is screened at a depth of 17.43 to 22.43 ft. Figure E8 shows the recorded water level for these wells. In both well pairs there appears to be a distinct upward gradient. In the CRS02NM and CRS02NS well pair, the water level in the shallower well is approximately 0.94 ft lower than the deeper well on average, with differentials of up to 1.76 ft. In the CRS02FM and CRS02FS well pair, the water level in the shallower well is approximately 0.88 ft lower than the deeper well on average, with differentials of up to 1.95 ft. In addition to the differentials observed in the well pairs, the wells closer to the Caloosahatchee River (CRS02NM and CRS02NS) appear to be on average several ft lower than the wells further to the south (CRS02FM and CRS02FS). This tends to indicate that the Caloosahatchee River is a groundwater sink in this area. Due to the significant differences in the observed head within this well cluster, the water levels in the shallower wells was used to set the 3-D total head boundary conditions in Layers 1, 2, and 3, while the water levels in the deeper wells was used to set the 3-D total head boundary conditions in Layers 5 and 6.

HE-857_G: This gage is located in Hendry County in the western potion of the HHD Phase 1A model domain. The well has a total depth of 20 ft and is screened at a depth of 12 to 20 ft. Two data sets exist in DBHydro for this gage. Figure E9 shows the recorded water level for these data sets. The data set that runs between 09NOV77 and 05NOV79 shows a constantly decreasing trend, which may indicate a bad transducer. Because this data appears to be suspect, it was not be used in defining the model boundary conditions. The remaining data set is comprised of a limited number of points, bit was still considered useful for assigning boundary conditions. The maximum data set value

is 20.91 ft NGVD29 and the minimum data set value for the remaining data is 18.16 ft NGVD29.

In addition to the groundwater wells discussed above, four additional gages were identified in the immediate vicinity of Lake Okeechobee. The water levels in these four wells were compared to the Lake Okeechobee stage to determine if a hydrostatic groundwater boundary condition assumption based on the Lake stage was appropriate.

PB-505_G: This gage is located in Palm Beach County along the perimeter of Lake Okeechobee, north of the L-10 canal. The well has a total depth of 15.6 ft. Figure E10 shows the recorded water level for this well, as well as, the Lake Okeechobee stage at S352. The maximum data set value for the well is 14.92 ft NGVD29 and the minimum data set value is 9.91 ft NGVD29. During the overlapping period of record, it appears that the water level in the well is generally below the lake stage under high stage conditions. However, as the lake stage drops, the water level in the well approaches that of the lake stage. Layer 2 is approximately 10 ft thick in this area. Because Layer 2 is comprised of lower permeability materials, it may be dampening the groundwater response to lake stage fluctuations.

PB-506_G: This gage is located in Palm Beach County along the perimeter of Lake Okeechobee, near S3 and S354. The well has a total depth of 15.3 ft and is screened at a depth of 11.4 to 15.3 ft. Figure E11 shows the recorded water level for this well, as well as, the Lake Okeechobee stage at S3. The maximum data set value for the well is 12.6 ft NGVD29 and the minimum data set value is 7.44 ft NGVD29. During the overlapping period of record, it appears that the water level in the well is generally below the lake stage. The thickness of Layer 2 varies between 5 and 10 ft in this area. Again, because Layer 2 is comprised of lower permeability materials, it may be dampening the groundwater response to lake stage fluctuations.

GL-293_G: This gage is located in Glades County along the perimeter of Lake Okeechobee, near S4. The well has a total depth of 9.0 ft and is screened at a depth of 5.0 to 9.0 ft. Figure E12 shows the recorded water level for this well, as well as, the Lake Okeechobee stage at S4. The maximum data set value for the well is 14.43 ft NGVD29 and the minimum data set value is 8.04 ft NGVD29. During the overlapping

period of record, it appears that the water level in the well is generally below the lake stage under high stage conditions. However, as the lake stage drops, the water level in the well approaches that of the lake stage. The thickness of Layer 2 varies between 5 and 10 ft in this area. With lower permeability materials in Layer 2, it may be dampening the groundwater response to lake stage fluctuations.

L OKEE.M_G: This gage is located in Glades County within the perimeter of Lake Okeechobee, near the Caloosahatchee River. No depth or screen information was available. Figure E13 shows the recorded water level for this well, as well as, the Lake Okeechobee stage at S4. The maximum data set value for the well is 18.69 ft NGVD29 and the minimum data set value is 10.74 ft NGVD29. During the overlapping period of record, it appears that the water level in the well generally matches the lake stage, except under low stage conditions. This trend does not match that seen in the other perimeter lake wells. One reason for this discrepancy may be due to the thin to non-existent peat, clay and silt (Layer 2) in this area. This puts the lake in direct contact with the more permeable sands the well is screened in. This allows the groundwater level to fluctuate with the lake when Lake Okeechobee is acting as a source to groundwater (higher stage periods). However, as the lake level drops the regional groundwater flow begins to control the water levels in the well. During these periods, groundwater flow appears to flow into Lake Okeechobee.

After screening the collected data, the value of the 95th, 50th, and 5th percentiles were determined for each well location to determine the high, medium, and low values for sensitivity analysis. Table 4 summarizes the available groundwater data sets, and Table 5 shows the ranges of total heads (in feet) that was used in the sensitivity analysis. Both the NGVD29 and the NAVD88 values are given in Table 5, but only the NAVD88 values were used in the HHD Phase 1A model.

Due to the differences noted above in the wells along the perimeter of Lake Okeechobee, boundary conditions assigned to the groundwater may differ from the lake stage boundary applied to the surface of the model. This variation in the application of groundwater boundary conditions is consistent with the findings of the System Wide Water Resources Program regional demonstration model developed by ERDC during 2006.

Table 4. Summary of available NGVD29 groundwater total head data for the HHD Phase 1A model.

Well Name	DB Key	Collection Agency	Data Type	Data Start Date	Data End Date	# of Data Values	Max Value	Min Value	95th Percentile	5th Percentile
HE-5	8322	USGS	RAND	29-Oct-80	29-Mar-88	63	26.24	22.29	25.64	22.85
HE-5	TA276	WMD_MOD1	MAX	1-Jan-81	28-Oct-83	903	26.51	22.25	25.75	22.69
HE-339_G	2500	USGS	MAX	1-Oct-73	30-Sep-79	2191	14.74	10.76	13.79	11.39
HE-339_G	2502	USGS	RAND	30-Oct-79	29-Mar-88	86	15.11	10.95	13.31	11.41
MOP2GW1	TA208	WMD_MOD1	MEAN	9-Dec-97	31-Dec-00	1119	14.49	9.5	13.88	10.32
MOP2GW1	H1967	WMD_CR10	MEAN	9-Dec-97	13-Apr-05	2683	14.49	9.5	13.76	11.33
MOP2GW2	H1970	WMD_CR10	MEAN	9-Dec-97	12-Apr-05	2682	14.46	9.49	13.76	11.36
MOP2GW3	H1971	WMD_CR10	MEAN	9-Dec-97	13-Apr-05	2683	14.59	9.4	13.96	11.55
ENR001W1	H1976	WMD_CR10	MEAN	28-Jan-98	5-Mar-07	3297	12.36	8.73	11.46	10.14
ENR001W1	TA207	WMD_MOD1	MEAN	28-Jan-98	31-Dec-00	1069	12.36	9.69	11.43	10.34
ENR001W2	H1977	WMD_CR10	MEAN	28-Jan-98	5-Mar-07	3297	12.37	12.37	11.55	10.23
PB-831_G	2811	USGS	MAX	1-Nov-74	8-Feb-07	11541	23.69	18.53	22.74	19.64
PB-831_G	P0779	WMD_MOD1	MAX	1-Jan-78	31-Dec-04	9620	23.56	18.53	22.75	19.64
M-1048_G	3021	USGS	MAX	25-Sep-74	28-Feb-07	11373	34.05	24.65	32.00	26.30
M-1048_G	TA198	WMD_MOD1	MAX	1-Jan-81	31-Dec-00	7014	33.81	25.85	32.03	26.52
M-928_G	3019	USGS	MAX	1-Oct-73	27-Apr-77	1305	31.98	26	30.98	26.22
M-928_G	3020	USGS	MEAN	20-May-57	30-Sep-73	1155	33.35	20.7	32.56	27.13
CRS02FM	L7465	WMD_CR10	MEAN	3-Nov-99	23-Feb-07	2501	15.59	10.95	14.83	11.70
CRS02FM	UD287	WMD_CR10	MEAN	3-Nov-99	11-Jan-06	2262	15.59	10.95	14.84	11.73
CRS02FS	L7464	WMD_CR10	MEAN	3-Nov-99	23-Feb-07	2587	15.37	9.22	14.36	10.26
CRS02FS	TA204	WMD_MOD1	MEAN	3-Nov-99	31-Dec-00	425	13.69	9.62	13.41	9.88
CRS02NM	L7449	WMD_CR10	MEAN	4-Nov-99	23-Feb-07	2668	14.01	10.38	13.23	11.72
CRS02NM	UD379	WMD_MOD1	MEAN	4-Nov-99	17-Oct-05	2175	13.85	10.38	13.25	11.72
CRS02NS	L7448	WMD_CR10	MEAN	4-Nov-99	23-Feb-07	2614	12.86	9.15	12.19	10.69
CRS02NS	TA205	WMD_MOD1	MEAN	4-Nov-99	31-Dec-00	424	12	10.66	11.79	10.76
HE-857_G	2755	USGS	RAND	9-Oct-85	29-Mar-88	31	20.91	18.16	20.82	18.56
PB-505_G	2830	USGS	MAX	1-Oct-73	30-Sep-86	4661	14.92	9.91	14.45	10.8
PB-506_G	2684	USGS	MAX	26-Sep-73	30-Sep-86	4254	12.6	7.44	11.10	8.86
PB-506_G	2685	USGS	MEAN	5-Nov-69	30-Sep-73	255	12.02	8.74	11.62	9.03
GL-293_G	2797	USGS	MAX	28-Sep-73	30-Sep-86	3923	14.43	8.04	13.62	10.44
GL-293_G	TA211	WMD_MOD1	MAX	9-Jan-81	30-Sep-86	1790	14.27	9.46	13.33	10.37
L OKEE.M_G	J0082	WMD_CR10	MEAN	1-Jul-99	1-Apr-07	2826	18.1	12.84	16.8	12.85
L OKEE.M_G	TA224	WMD_MOD1	MEAN	1-Jan-81	1-Jul-99	6352	18.69	10.74	17.18	11.88

Table 5. Summary of groundwater total head data conversion from NGVD29 to NAVD88 for HHD Phase 1A model.

Well Name	DB Key	95th Percentile	5th Percentile	Adopted Range for Model NGVD29 Maximum	NGVD29 Median	NGVD29 Minimum	Conversion Factor	NAVD88 Maximum	NAVD88 Median	NAVD88 Minimum
HE-5	8322	25.64	22.85	25.75	24.22	22.69	-1.316	24.43	22.90	21.37
HE-5	TA276	25.75	22.69							
HE-339_G	2500	13.79	11.39	13.79	12.59	11.39	-1.375	12.42	11.21	10.01
HE-339_G	2502	13.31	11.41							
MOP2GW1	TA208	13.88	10.32	13.88	12.10	10.32	-1.43	12.45	10.67	8.89
MOP2GW1	H1967	13.76	11.33							
MOP2GW2	H1970	13.76	11.36							
MOP2GW3	H1971	13.96	11.55							
ENR001W1	H1976	11.46	10.14	11.43	10.89	10.34	-1.43	10.00	9.46	8.91
ENR001W1	TA207	11.43	10.34							
ENR001W2	H1977	11.55	10.23							
PB-831_G	2811	22.74	19.64	22.75	21.20	19.64	-1.407	21.34	19.79	18.23
PB-831_G	P0779	22.75	19.64							
M-1048_G	3021	32.00	26.30	32.03	29.28	26.52	-1.345	30.69	27.93	25.18
M-1048_G	TA198	32.03	26.52							
M-928_G	3019	30.98	26.22	32.56	29.85	27.13	-1.345	31.21	28.50	25.79
M-928_G	3020	32.56	27.13							
CRS02FM	L7465	14.83	11.70	13.25	12.49	11.72	-1.207	12.04	11.28	10.51
CRS02FM	UD287	14.84	11.73							
CRS02FS	L7464	14.36	10.26	11.79	11.28	10.76	-1.207	10.58	10.07	9.55
CRS02FS	TA204	13.41	9.88							
CRS02NM	L7449	13.23	11.72	13.25	12.49	11.72	-1.207	12.04	11.28	10.51
CRS02NM	UD379	13.25	11.72							
CRS02NS	L7448	12.19	10.69	11.79	11.28	10.76	-1.207	10.58	10.07	9.55
CRS02NS	TA205	11.79	10.76							
HE-857_G	2755	20.82	18.56	20.82	19.69	18.56	-1.253	19.56	18.43	17.30
PB-505_G	2830	14.45	10.8	14.45	12.63	10.80	-1.24	13.21	11.39	9.56
PB-506_G	2684	11.10	8.86	11.10	9.98	8.86	-1.358	9.74	8.62	7.50
PB-506_G	2685	11.62	9.03							
GL-293_G	2797	13.62	10.44	13.62	12.00	10.37	-1.23	12.39	10.77	9.14
GL-293_G	TA211	13.33	10.37							
L OKEE.M_G	J0082	16.8	12.85	17.18	14.53	11.88	-1.191	15.99	13.34	10.69
L OKEE.M_G	TA224	17.18	11.88							

Canal stage data

Figure 35 shows the location of the surface water canal gages in the vicinity of the model with more than five years of records. Stage data was also downloaded from the SFWMD's DBHydro data base for the available period of record for each gage. Stage data for the canals within the model domain were applied to the surface of the model as constant head boundary conditions, which allowed these canals to act as either sources or sinks to groundwater in the HHD Phase 1A model, depending on the other hydro-geologic parameters in the model. The following description for each gage summarizes the available information. The historical data compiled at these canal water stage gages are plotted and given in Appendix E (Figures E14 through E32).

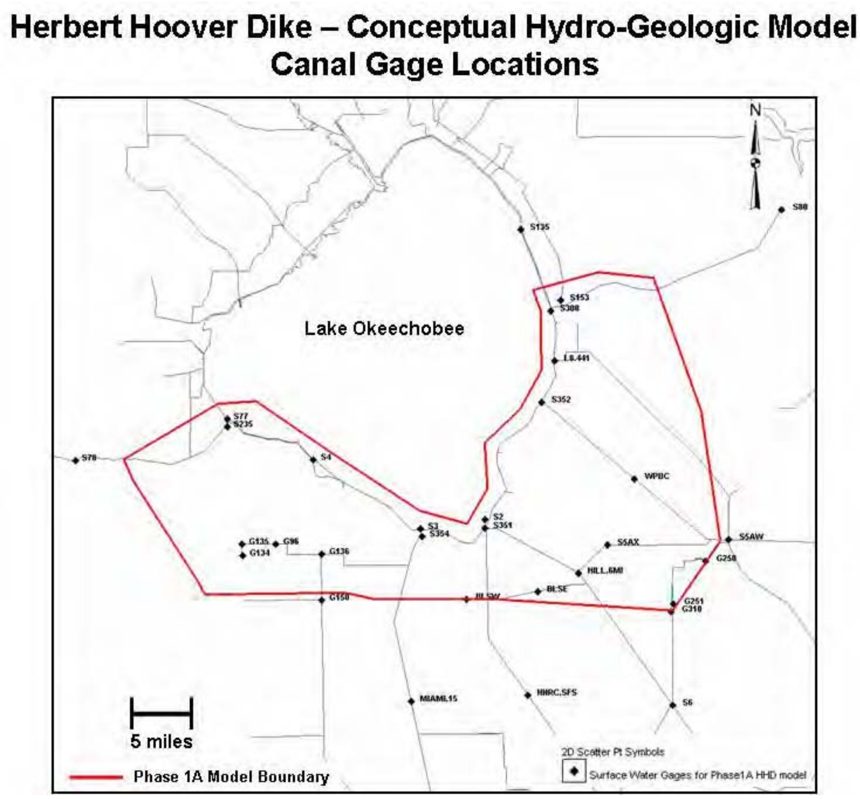

Figure 35. Canal water stage gage locations considered in the HHD Phase 1A model.

S153 and S308 (Figure E14): These structures are located in Martin County at the confluence of Lake Okeechobee and the St. Lucie Canal (C-44). The headwater stage of S308 reflects the Lake Okeechobee stage, while the tail water stage reflects the stage at the eastern extent of the St. Lucie Canal. The headwater stage of S153 reflects the stage in the Lake

Okeechobee exterior perimeter canal C-44A, while the tail water stage reflects the stage at the eastern extent of the St. Lucie Canal.

L8.441 (Figure E15): This gage is located in Palm Beach County at the confluence of Lake Okeechobee and the L8 canal. Since this gage is not a structure used to control flow, only one set of data is available at this gage. The data at this gage show significantly more variability than that of the Lake Okeechobee gages in the area. These fluctuations are most likely due to fluctuations in drainage to the L8 canal and are not representative in fluctuation of the lake level.

S352 (Figure E16): This gage is located in Palm Beach County at the confluence of Lake Okeechobee and the L10 canal. The headwater stage of S352 reflects the Lake Okeechobee stage, while the tail water stage reflects the stage at the heads of the L10 canal.

S351 and S2 (Figure E17): These structures are located in Palm Beach County at the confluence of Lake Okeechobee, L14 and L20. S351 is a gated structure that allows water to pass from Lake Okeechobee to the L14 and L20 canals. S2 is a pump station that pumps canal water into Lake Okeechobee. The headwater stage of S351 reflects the Lake Okeechobee stage, while the tail water stage reflects the stage of the downstream canals. The headwater stage of S2 reflects the stage of the downstream canals, while the tail water stage reflects the stage in the Lake Okeechobee.

S354 and S3 (Figure E18): These structures are located in Palm Beach County at the confluence of Lake Okeechobee and the L25 canal. S354 is a gated structure that allows water to pass from Lake Okeechobee to the L25 canal. S3 is a pump station that pumps canal water into Lake Okeechobee. The headwater stage of S354 reflects the Lake Okeechobee stage, while the tail water stage reflects the stage of the downstream canal. The headwater stage of S3 reflects the stage of the downstream canals, while the tail water stage reflects the stage in the Lake Okeechobee.

S4 (Figure E19): This pump station is located in Glades County at the confluence of Lake Okeechobee and the C20 perimeter canal. The headwater stage of S4 reflects the perimeter canal, while the tail water stage reflects the Lake Okeechobee stage.

S77 and S235 (Figure E20): These structures are located in Glades County at the confluence of Lake Okeechobee and the Caloosahatchee River (C-43). The headwater stage of S77 reflects the Lake Okeechobee stage, while the tail water stage reflects the stage of the Caloosahatchee River. The headwater stage of S235 also reflects the stage of the Caloosahatchee River, while the tail water stage reflects the stage in the LD-3 perimeter canal. Because the stage data for S77 is limited, the model used the headwater data from S235 for the Caloosahatchee River and the interior lake gage, L0005, for Lake Okeechobee in this area.

BLSW (Figure E21), BLSE (Figure E22), and HILL.6MI (Figure E23): These gages are located in Palm Beach County along the Bolles Canal. Because these gages are not structures used to control flow, only one set of data is available at each gage.

S5AX (Figure E24): This gage is located in Palm Beach County along Ocean Canal. The headwater and tail water stage of S5AX are similar during the available period of record.

S5AS and S5AW (Figure E25): These structures are located in Palm Beach County at the northern end of Water Conservation Area 1(WCA-1). The headwater stage of S5AS reflects the stage in the L8 canal, while the tail water stage reflects the stage at in WCA-1. The headwater stage of S5AW reflects the stage in L10, while the tail water stage reflects the stage in the L8 canal. Because the tail water stage data for S5AW is limited, the model used the headwater data from S5AS for the L8 canal.

WPBC (Figure E26): This gage is located in Palm Beach County along the L10 canal. Because this gage is not a structure used to control flow, only one set of data is available at this gage.

G134 (Figure E27): This gage is located in Hendry County and is a single-barreled corrugated metal pipe culvert, located about one mile below the outlet of the Montura Ranch Estates Reservoir, at the south end of Flaghole Road, about a mile south of Canal L1. The headwater of G134 is to the south of the structure, while the tail water is to the north along the L1 canal.

G135 (Figure E28): This gage is located in Hendry County and is a single-barreled corrugated metal pipe culvert, located at the south boundary of the Flaghole Drainage District. Control is affected by stop logs in a riser at

the south end of the culvert. The headwater of G135 is to the south of the structure, while the tail water is to the north along the L1 canal.

G96 (Figure E29): This gage is located in Hendry County and is a double-barreled, corrugated metal pipe culvert, located in a plug in the L1 borrow canal about three miles east of Flag Hole Road. The headwater of G96 is to the west of the structure, while the tail water is to the east along the L1 canal.

G136 (Figure E30): This gage is located in Hendry County and is a three-barreled corrugated metal pipe culvert, located at the bend in L1 about three miles north of SR 832. Control is affected by stop logs in risers in each culvert. The headwater of G136 is to the west of the structure, while the tail water is to the east along the L1 canal.

G150 (Figure E31): This gage is located in Hendry County and is a three-barreled corrugated metal pipe culvert, located at the divide line of L-1 and L-2. Control is affected by slide gates at the south side of the culverts. The headwater of G150 is to the north of the structure, while the tail water is to the south.

G251 and G310 (Figure E32): These structures are located in Palm Beach County at the southeast corner of the Everglades Nutrient Removal Project. G310 is a pump station located at the south corner of STA-1W. The G251 pump station is located to the east of G310 and is used to pump treated agricultural runoff water from the ENR project into Water Conservation Area 1. The headwater stage of G310 is on the northern side of the pump station, while the tail water is on the southern side of the pump station. The headwater stage of G251 reflects the stage on the western side of the pump station, while the tail water stage reflects the stage on the eastern side of the pump station.

Like the groundwater head data, the surface water stage data was collected, processed, and reviewed by NAP and ERDC for its suitability in the Phase 1A model. The values for the 95th, 50th, and 5th percentiles were determined for each data set. These values are defined as the high, medium, and low values for sensitivity analysis. Table 6 summarizes the available surface water data sets, and Table 7 shows the ranges of stages (in feet) that were used in the sensitivity analysis. The NAVD88 values were used.

Table 6. Summary of available NGVD29 surface water stage data for the HHD Phase 1A model.

Well Name	DB Key	Collection Agency	Data Type	Data Start Date	Data End Date	# of Data Values	Max Value	Min Value	95th Percentile	5th Percentile
S308_H	TA368	COE	MEAN_MOD1	29860	37621	7716	18.7	8.83	17.33	11.04
S308_T	TA310	WMD	MEAN_MOD1	29860	37621	7715	18.03	8.78	14.65	10.75
S80_H	TA256	WMD	MEAN_MOD1	32051	36891	4830	16.95	9.55	14.53	11.45
S80_T	TA259	WMD	MEAN_MOD1	32082	34739	2621	3.19	-0.83	1.53	-0.17
L8.441	PC817	WMD	MEAN_MOD1	28491	36352	9809	19.04	8.59	16.10	10.86
S352_H	TA371	WMD	MEAN_MOD1	28491	37621	9131	18.66	8.73	17.35	10.97
S352_T	TA372	WMD	MEAN_MOD1	28491	37621	9105	14.31	7.15	12.17	9.49
S5AW_H	TA380	WMD	MEAN_MOD1	31444	37621	6178	12.37	7.68	11.54	9.04
S5AW_T	TA381	WMD	MEAN_MOD1	36978	37621	644	17.82	9.45	16.02	10.11
S351_H	M1418	WMD	MEAN	36607	39146	2540	18.17	9.35	16.78	10.30
S351_T	M1419	WMD	MEAN	36607	39146	2519	12.49	8.96	11.65	9.73
S4_H	TA221	WMD	MEAN_MOD1	29587	36891	7219	14.03	8.24	12.76	10.44
S4_T	TA223	WMD	MEAN_MOD1	29587	36891	7103	18.78	9.76	17.37	11.27
S3_H	6633	WMD	MEAN_TELE	31198	39145	7852	13.03	8.14	11.85	9.84
S3_T	6634	WMD	MEAN_TELE	31228	39145	7848	18.82	9.06	17.13	11.41
S2_H	6562	WMD	MEAN_TELE	31198	39145	7864	13.15	8.87	11.87	9.86
S2_T	6566	WMD	MEAN_TELE	31198	39145	7878	18.9	9.39	17.14	11.38
S135_H	15803	WMD	MEAN_TELE	34590	39145	4554	18.67	8.86	17.47	11.10
S135_T	15802	WMD	MEAN_TELE	34590	39145	4555	14.82	8.82	13.83	11.25
S354_H	M1437	WMD	MEAN_GRID	36622	39146	2525	18.26	9.06	16.83	10.37
S354_T	M1438	WMD	MEAN_GRID	36622	39146	2517	12.73	8.83	11.69	9.64
G404_H	NV886	WMD	MEAN_TELE	37284	39149	1866	11.86	9.39	11.28	9.79
G404_T	NV887	WMD	MEAN_TELE	37284	39149	1866	14.77	8.42	14.40	10.47
S77_H	JB188	WMD	MEAN_OMD	35932	37836	1895	17.78	8.78	16.39	9.97
S77_T	J1497	WMD	MEAN_OMD	35932	37836	1895	11.79	8.74	11.36	9.82
S78_H	JB185	WMD	MEAN_OMD	35932	37836	1895	11.73	8.79	11.39	9.91
S78_T	JB186	WMD	MEAN_OMD	35932	37836	1885	5.09	2.18	3.37	2.10
S5AX_H	6680	WMD	MEAN_TELE	31198	38558	5325	13.88	6.22	11.65	9.61
S5AX_T	6681	WMD	MEAN_TELE	31198	36446	4836	15.61	6.27	11.72	9.86
WPBG	5579	WMD	MEAN_TELE	31290	38800	7457	12.96	7.44	11.43	9.30
BLSE	G5163	WMD	MEAN_TELE	35446	39147	3692	14.34	8.53	11.90	9.65
BLSW	G5164	WMD	MEAN_TELE	35446	39133	3267	13.4	8.84	12.16	10.25
HILL6MI	4136	WMD	MEAN_TELE	31290	38808	6865	14.08	7.54	11.61	9.64
MIAMI.15	3722	WMD	MEAN_TELE	31290	38103	6618	12.6	7.92	11.85	9.97
S6_H	6684	WMD	MEAN_TELE	31198	39146	7876	12.6	7.59	11.46	9.12
S6_T	6685	WMD	MEAN_TELE	31198	39146	7852	18.16	9.75	17.04	12.11
S8_H	6697	WMD	MEAN_TELE	31290	39140	7851	13.25	7.91	12.14	9.69
S8_T	6698	WMD	MEAN_TELE	31290	39140	7824	14.95	6.36	14.00	9.42
NNRC.SFS	5581	WMD	MEAN_TELE	31444	39142	7591	13.2	7.73	11.77	9.98
S153_H	5759	WMD	MEAN_TELE	31198	39141	7931	19.75	18.07	19.24	18.69
S153_T	5763	WMD	MEAN_TELE	31198	39141	7934	17.88	8.9	14.63	11.24
S235_H	TA216	WMD	MEAN_MOD1	29587	36891	7305	14.22	7.31	12.54	10.34
S235_T	TA218	WMD	MEAN_MOD1	29587	36891	7305	12.69	8.88	11.50	10.59
S5AS_H	PN454	WMD	Mean_MOD2	28491	37986	9496	19.33	8.38	16.09	10.45
S5AS_T	6693	WMD	MEAN_TELE	31198	39160	7842	18.98	9.89	17.12	12.18
G134_H	TA243	WMD	MEAN_MOD1	31594	38717	6998	22.57	17.03	20.44	17.65
G134_T	TA245	WMD	MEAN_MOD1	31594	38717	7108	21.43	15.43	19.28	17.13
G135_H	TA250	WMD	MEAN_MOD1	31594	38717	7108	21.16	15.38	19.21	16.90
G135_T	TA251	WMD	MEAN_MOD1	31594	38717	7108	20.03	12.53	17.67	15.91
G136_H	TA235	WMD	MEAN_MOD1	30436	38717	8292	17.35	9.88	14.50	11.37
G136_T	TA237	WMD	MEAN_MOD1	30436	38717	8292	15.57	8.82	12.42	10.11
G96_H	TA252	WMD	MEAN_MOD1	31594	38717	7108	18.01	10.31	16.68	12.71
G96_T	TA253	WMD	MEAN_MOD1	31594	38717	7108	17.15	10.02	14.52	11.37
G150_H	15521	WMD	MEAN_GRID	33951	39180	4787	18.75	10.68	16.51	11.88
G150_T	15522	WMD	MEAN_GRID	33951	39180	4787	17.38	8.32	14.55	11.09
G250S_H	15870	WMD	MEAN_TELE	34536	39173	4618	11.43	6.56	8.75	7.17
G250_H	15869	WMD	MEAN_TELE	34215	39173	2001	12.12	7.45	11.52	9.19
G250_T	16217	WMD	MEAN_TELE	34215	39173	4914	14.66	6.91	13.40	11.21
G251_H	16218	WMD	MEAN_TELE	34256	39173	4890	13.64	8.12	12.32	9.77
G251_T	16219	WMD	MEAN_TELE	34249	39173	4915	18.43	12.06	17.31	14.63
G310_H	M5154	WMD	MEAN_DWR	36685	37833	1149	9.99	7.22	9.49	8.06
G310_T	M5155	WMD	MEAN_DWR	36685	37833	1149	17.95	11.51	17.25	14.03

Table 7. Summary of surface water stage data conversion from NGVD29 to NAVD88 for HHD Phase 1A. model

Well Name	DB Key	NGVD29 Maximum	NGVD29 Median	NGVD29 Minimum	Conversion Factor	NAVD88 Maximum	NAVD88 Median	NAVD88 Minimum
S308_H	TA308	17.33	14.91	11.04	-1.23	16.10	13.68	9.81
S308_T	TA310	14.65	14.20	10.75	-1.23	13.42	12.97	9.52
S80_H	TA256	14.53	14.15	11.45	-1.457	13.07	12.69	9.99
S80_T	TA259	1.53	0.43	-0.17	-1.457	0.07	-1.03	-1.63
L8.441	PC817	16.10	14.01	10.86	-1.24	14.86	12.77	9.62
S352_H	TA311	17.35	14.93	10.97	-1.24	16.11	13.69	9.73
S352_T	TA312	12.17	10.99	9.49	-1.24	10.93	9.75	8.25
S5AW_H	TA380	11.54	10.60	9.04	-1.434	10.11	9.17	7.61
S5AW_T	TA381	16.02	13.85	10.11	-1.434	14.58	12.41	8.68
S351_H	MI418	16.78	14.69	10.30	-1.355	15.43	13.34	8.94
S351_T	MI419	11.65	10.76	9.73	-1.355	10.30	9.41	8.38
S4_H	TA221	12.76	11.34	10.44	-1.276	11.49	10.06	9.16
S4_T	TA223	17.37	15.06	11.27	-1.276	16.09	13.78	9.99
S3_H	6633	11.85	10.98	9.84	-1.355	10.50	9.63	8.49
S3_T	6634	17.13	14.97	11.41	-1.355	15.77	13.62	10.06
S2_H	6562	11.87	10.93	9.86	-1.355	10.52	9.58	8.51
S2_T	6566	17.14	14.95	11.38	-1.355	15.79	13.60	10.03
S135_H	15803	17.47	15.11	11.10	-1.22	16.25	13.89	9.88
S135_T	15802	13.83	13.55	11.25	-1.22	12.61	12.33	10.03
S354_H	MI437	16.83	14.75	10.37	-1.355	15.48	13.40	9.02
S354_T	MI438	11.69	10.79	9.64	-1.355	10.34	9.44	8.28
G404_H	MW886	11.28	10.61	9.79	-1.437	9.84	9.17	8.35
G404_T	MW887	14.40	12.92	10.47	-1.437	12.96	11.48	9.03
S77_H	JB188	16.39	14.69	9.97	-1.184	15.21	13.51	8.78
S77_T	J1497	11.36	11.00	9.82	-1.184	10.18	9.82	8.64
S78_H	JB185	11.39	11.02	9.91	-1.171	10.22	9.85	8.74
S78_T	JB186	3.37	2.97	2.70	-1.171	2.20	1.80	1.53
S5AX_H	6680	11.65	10.75	9.61	-1.385	10.27	9.37	8.23
S5AX_T	6681	11.72	10.86	9.86	-1.385	10.34	9.48	8.47
WP BG	5519	11.43	10.59	9.30	-1.362	10.07	9.23	7.94
BLSE	G5163	11.90	10.72	9.65	-1.375	10.53	9.35	8.28
BLSW	G5164	12.16	11.22	10.25	-1.388	10.77	9.83	8.86
HILLSMI	4136	11.61	10.78	9.64	-1.401	10.21	9.38	8.24
MIAMI.15	3722	11.85	11.05	9.97	-1.421	10.43	9.63	8.55
S6_H	6684	11.46	10.60	9.12	-1.457	10.00	9.14	7.66
S6_T	6685	17.04	15.38	12.11	-1.457	15.58	13.92	10.65
S8_H	6697	12.14	10.98	9.69	-1.437	10.70	9.54	8.25
S8_T	6698	14.00	11.41	9.42	-1.437	12.56	9.97	7.98
NNRC.SFS	5581	11.77	11.01	9.98	-1.427	10.34	9.58	8.55
S153_H	5159	19.24	19.02	18.69	-1.234	18.01	17.79	17.46
S153_T	5163	14.63	14.13	11.24	-1.234	13.40	12.90	10.00
S235_H	TA216	12.54	11.24	10.34	-1.184	11.36	10.06	9.16
S235_T	TA218	11.50	11.10	10.59	-1.184	10.32	9.92	9.41
S5AS_H	PN454	16.09	13.32	10.45	-1.434	14.66	11.89	9.02
S5AS_T	6693	17.12	15.49	12.18	-1.434	15.69	14.06	10.75
G134_H	TA243	20.44	19.48	17.65	-1.312	19.13	18.17	16.34
G134_T	TA245	19.28	17.96	17.13	-1.312	17.97	16.65	15.82
G135_H	TA250	19.21	17.72	16.90	-1.306	17.90	16.41	15.59
G135_T	TA251	17.67	17.06	15.91	-1.306	16.36	15.75	14.61
G136_H	TA235	14.50	13.16	11.37	-1.345	13.16	11.82	10.03
G136_T	TA237	12.42	11.20	10.11	-1.345	11.08	9.86	8.77
G96_H	TA252	16.68	14.47	12.71	-1.316	15.36	13.15	11.39
G96_T	TA253	14.52	13.19	11.37	-1.316	13.20	11.87	10.05
G150_H	15521	16.51	14.48	11.88	-1.368	15.14	13.11	10.51
G150_T	15522	14.55	13.33	11.09	-1.368	13.18	11.96	9.72
G250S_H	15870	8.75	7.73	7.17	-1.427	7.32	6.30	5.74
G250_H	15869	11.52	10.34	9.19	-1.427	10.09	8.91	7.76
G250_T	16217	13.40	12.28	11.21	-1.427	11.97	10.85	9.78
G251_H	16218	12.32	11.13	9.77	-1.43	10.89	9.70	8.34
G251_T	16219	17.31	16.38	14.63	-1.43	15.88	14.95	13.20
G310_H	MS154	9.49	8.97	8.06	-1.43	8.06	7.54	6.63
G310_T	MS155	17.25	16.23	14.03	-1.43	15.82	14.80	12.60

In addition to the gages discussed above, data were collected for the S78, S80, S135, G404, MIAMI_15, S6, S8, and NNRC.SFS surface water gages. Although these gages are not within the model domain, the data from these gages were interpolated to set surface water boundary conditions within the model. The data from these gages is also summarized in Tables 6 and 7.

Lake Okeechobee stage data

In addition to the structure headwater stage data mentioned above, four stage gages were used to determine lake levels in the interior of Lake Okeechobee. The locations of these gages are shown on Figure 36.

Although data were collected for these gages (Table 8), the data were not used in the Phase 1A modeling effort. The data from these gages are similar to the headwater data of the gate structures around the lake. The headwater data for the structures were used to set the lake stage boundary conditions because the headwater data are more consistent with the heads along the model boundary.

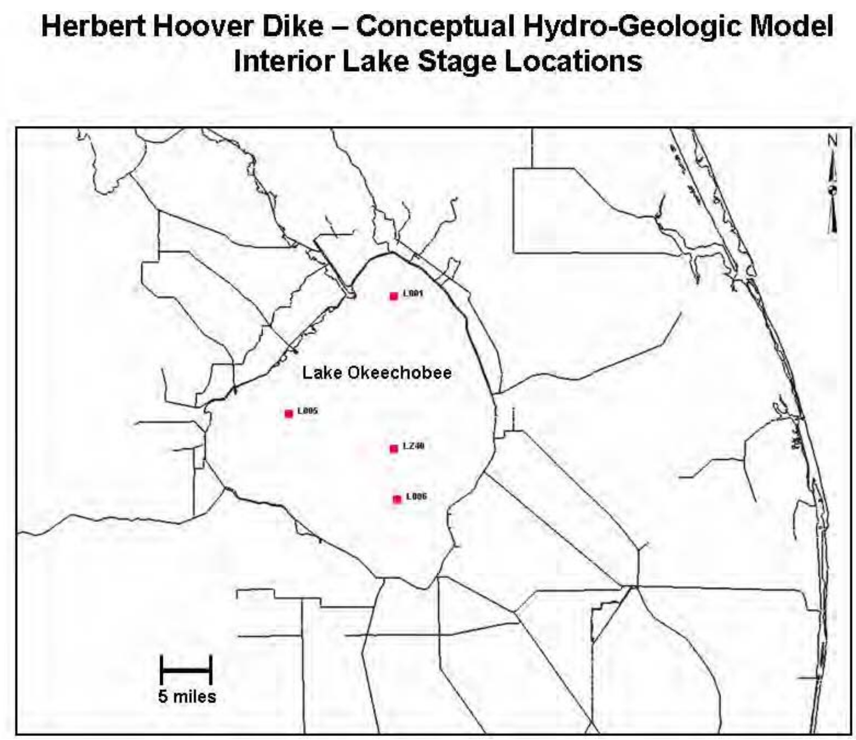

Figure 36. Lake Okeechobee water stage gage locations considered in the HHD Phase 1A model.

Table 8. Summary of available NGVD29 Lake Okeechobee stage data and date conversion from NGVD29 to NAVD88 for the HHD Phase 1A model.

Well Name	DB Key	Collection Agency	Data Type	Data Start Date	Data End Date	# of Data Values	Max Value	Min Value	95th Percentile	5th Percentile
L001	16022	WMD	MEAN_CR10	34550	39174	4577	18.99	8.87	17.29	10.88
L006	12519	WMD	MEAN_CR11	33053	39171	5381	18.68	8.86	17.18	11.27
LZ40	16265	WMD	MEAN_CR12	33045	39173	5126	18.7	9.06	17.23	11.14
L005	12509	WMD	MEAN_CR13	32744	39174	5783	18.51	8.84	17.34	11.40

Well Name	DB Key	NGVD29 Maximum	NGVD29 Median	NGVD29 Minimum	Conversion Factor	NAVD88 Maximum	NAVD88 Median	NAVD88 Minimum
L001	16022	**17.29**	**15.12**	**10.88**	**-1.217**	**16.08**	**13.90**	**9.66**
L006	12519	**17.18**	**15.08**	**11.27**	**-1.201**	**15.92**	**13.82**	**10.01**
LZ40	16265	**17.23**	**14.98**	**11.14**	**-1.26**	**16.00**	**13.75**	**9.91**
L005	12509	**17.34**	**15.07**	**11.40**	**-1.23**	**16.14**	**13.87**	**10.20**

Groundwater net recharge

Precipitation is generally the primary mechanism for recharging the groundwater system. However, only a portion of precipitation recharges the groundwater due to evapotranspiration, surface runoff, and other factors. The net recharge is the portion of precipitation that infiltrates to the groundwater table. According to Appendix A of the EAA Storage Reservoir Revised Draft PIR and EIS, dated February 2006 (USACE 2006c) , the average annual precipitation in this area is approximately 55 inches per year. However, this report also notes that “extensive dewatering and pumping operations greatly affect the amount of recharge able to reach the water table”. Consequently, it was determined that the maximum net recharge for this area is about 5 inches per year. During the EAA model simulations, net recharge rate varied between 0 and 5 inches per year. The EAA model results indicated that 0.5 inches of recharge per year was the most reasonable value. Based on these findings, the HHD Phase 1A model varied the net recharge rate among 0.0, 0.5 and 5.0 inches per year as low, medium, and high values, respectively, for the entire model domain.

Groundwater usage and withdrawal

Based on information provided by SAJ-EN-WM, approximately 290 groundwater pumping wells are permitted in the Surficial Aquifer System (SAS) within the Phase 1A model domain. Although actual groundwater withdrawal rates were not available for all wells, the pump capacities for these wells were available based on data obtained from SFWMD and well permits. The locations of the wells within the Phase 1A model domain (outlined in red) are shown in Figure 37. Each well location is color coded by the pump capacity for the well. The majority of the wells within the model domain have pump capacities below 250,000 cfd. These wells will be incorporated into the Phase 1A model based on the information in Table 9. Several wells were identified with expired permits. These wells were not modeled. For the sensitivity analysis simulation, a pumping rate of zero cfd was used as the minimum pumping value, while the pump capacity at each well was used as the maximum pumping value. The half capacity values were taken as the medium pumping values.

In addition to the wells with pump capacities less than 250,000 cfd, numerous wells were identified with larger pump capacities. As shown in Figures 38 and 39, several of these wells are in close proximity to HHD. Because these large capacity wells may significantly alter ground water

flow near the well, the specific information for each well was analyzed in greater detail. The following summarizes the available information for these large capacity wells.

RIDGDILL PIT NO 8: This well is located in Glades County in the western portion of the Phase 1A model domain (Figure 38). The permit indicates that this a single well used to dewater for shell rock mining operations. The pump capacity for this well is 577,540 cfd. The depth of this well is unknown; however, based on the available data, water is pumped from the water table aquifer. For the HHD Phase 1A model, the pumping was assumed to be distributed vertically across the nodes of the Layer 3A material. Although the permit for this well will expire in October 2009, this well was incorporated into the model using a maximum pumping rate of 577,540 cfd.

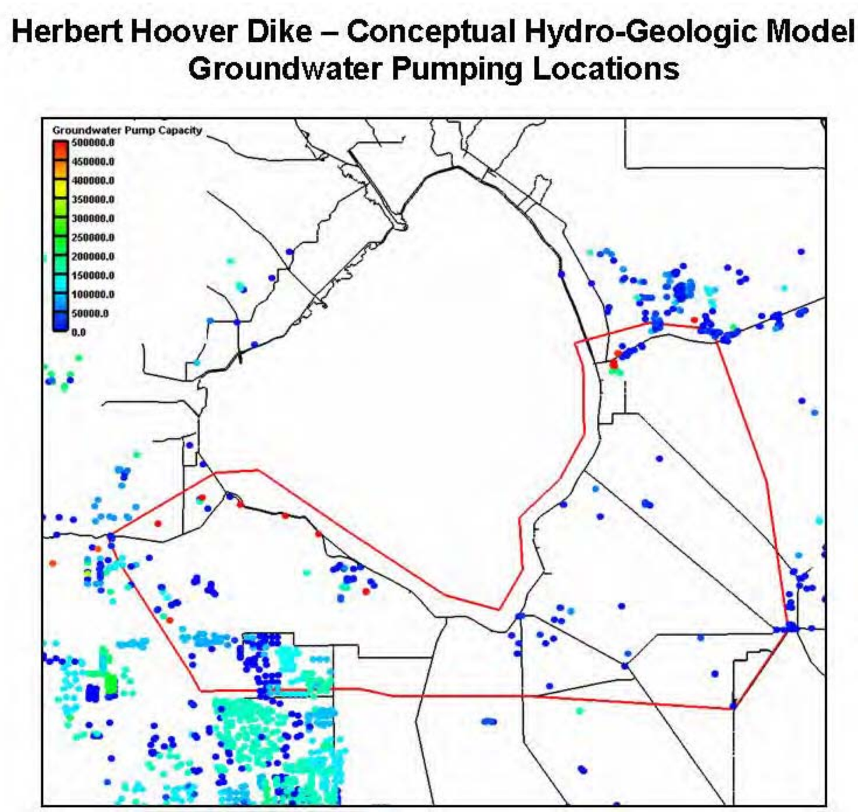

Figure 37. Groundwater pumping locations considered in the HHD Phase 1A model.

Table 9. Summary of available groundwater pumping data for the HHD Phase 1A model.

PERMIT NO	PROJECT NAME	NAME	X	Y	AQUIFER	PUMP CAPACITY(cfd)	WELL DIAMETER(in)	CASED DEPTH (ft)	WELL DEPTH(ft)
26-00514-W	AG MECH CITRUS GROVE	1	604081	867835	Tamiami	123,209	10	75	120
26-00740-W	ALFREDO AND FABIAN GARCIA	WELL #1	608100	865972	Aquifer	1,925	4	100	120
26-00740-W	ALFREDO AND FABIAN GARCIA	WELL #2	608412	865788	Aquifer	15,401	4	100	140
26-00631-W	ALICO HILLIARD LANDS	12	610338	851580	Tamiami	96,257	10	90	120
26-00631-W	ALICO HILLIARD LANDS	13	610484	854835	Tamiami	96,257	10	90	120
26-00631-W	ALICO HILLIARD LANDS	14	611242	850344	Tamiami	96,257	10	90	120
26-00631-W	ALICO HILLIARD LANDS	15	612557	851860	Tamiami	96,257	10	90	120
43-00418-W	ALPAT GROVES	5/40/38	803643	977573	Aquifer	96,257	10	105	125
22-00220-W	ALVIN WARD BOAT RAMP FACILITY	1	629982	909556	Aquifer	3,369	4	25	40
26-00720-W	AQUALIFE USA INC	1	601785	872290	Tamiami	14,439	4	110	140
26-00720-W	AQUALIFE USA INC	2	601710	872320	Tamiami	14,439	4	110	140
26-00720-W	AQUALIFE USA INC	3	601960	872320	Tamiami	14,439	4	110	140
26-00486-W	ARBULU TREE NURSERY	1	602257	870462	Tamiami	115,508	10	60	80
50-02925-W	ATLANTIC SUGAR ASSOCIATION	R-2	829724	836492	Aquifer	0	6	4	19
50-02925-W	ATLANTIC SUGAR ASSOCIATION	R-1	829724	836492	Aquifer	1,348	6	4	19
50-03555-W	ATLANTIC SUGAR MILL	P1	829652	836377	Aquifer	12,898	6	40	50
50-03555-W	ATLANTIC SUGAR MILL	P2	829655	836635	Aquifer	12,898	6	40	50
26-00318-W	BAYROCK GROVES	4	616548	848673	Tamiami	86,631	10	90	140
26-00318-W	BAYROCK GROVES	5	617924	848669	Tamiami	86,631	10	80	140
26-00318-W	BAYROCK GROVES	7	620572	848920	Tamiami	86,631	10	129	169
26-00318-W	BAYROCK GROVES	8	623358	852488	Tamiami	86,631	10	131	171
26-00318-W	BAYROCK GROVES	9	622782	849802	Tamiami	86,631	10	80	130
26-00318-W	BAYROCK GROVES	10	624735	851388	Tamiami	86,631	10	85	125
26-00318-W	BAYROCK GROVES	11	624532	849856	Tamiami	86,631	10	85	125
26-00318-W	BAYROCK GROVES	12	626043	849768	Tamiami	86,631	10	92	132
26-00318-W	BAYROCK GROVES	1	619921	850413	Tamiami	86,631	10	169	217
26-00318-W	BAYROCK GROVES	6	617468	852865	Tamiami	86,631	10	176	216
26-00318-W	BAYROCK GROVES	13	619327	852894	Tamiami	86,631	10	180	220
26-00318-W	BAYROCK GROVES	15	616066	851421	Tamiami	86,631	10	175	215
26-00318-W	BAYROCK GROVES	3	618019	850131	Tamiami	86,631	10	132	172
26-00318-W	BAYROCK GROVES	14	626533	851559	Tamiami	86,631	10	80	120
26-00318-W	BAYROCK GROVES	2	616880	850097	Tamiami	86,631	10	132	172
50-03513-W	BELLE GLADE ELEMENTARY SCHOOL	WELL	763622	859007	Aquifer	9,826	4	30	50
50-07373-W	BIG LAKE PLAZA	1	763418	851193	Aquifer	11,551	3	80	100
43-00732-W	BLOODS HAMMOCK GROVE - BLOCK 33	32-2	805363	978058	Aquifer	11,551	4	80	100
43-00732-W	BLOODS HAMMOCK GROVE - BLOCK 33	32-1	805466	979253	Aquifer	23,102	6	80	100
43-00732-W	BLOODS HAMMOCK GROVE - BLOCK 33	33-1	807122	978874	Aquifer	32,727	6	80	100
43-01749-W	BOOKER PARK	WELL 1	824613	977899	Aquifer	4,813		Assumed to be in Layer 3A	
43-01749-W	BOOKER PARK	WELL 2	824672	977629	Aquifer	6,738		Assumed to be in Layer 3A	
43-01749-W	BOOKER PARK	WELL 3	824368	977484	Aquifer	15,401		Assumed to be in Layer 3A	
50-03785-W	BOURNE FARM TRACTOR SHOP	1	807054	925179	Aquifer	5,775	4	50	100
50-01486-W	TREATMENT PLANT	1	780704	912627	Aquifer	61,604	12	24	42
26-00261-W	CHIPCO GROVE	1	591236	881500	Tamiami	92,406	10	70	170
26-00256-W	CITRUS NURSERY	2	675614	867920	Tamiami	38,503	10	112	146
26-00256-W	CITRUS NURSERY	1	675588	866923	Tamiami	57,754	6	112	146
26-00327-W	CLEGHORN HENDRY COUNTY FARM	2	585617	884417	Tamiami	115,508	8	90	140
26-00327-W	CLEGHORN HENDRY COUNTY FARM	4	585677	881369	Tamiami	115,508	8	90	140
26-00077-W	CLEWISTON FFA CHAPTER	1	620901	870973	Tamiami	0	4	0	55
26-00077-W	CLEWISTON FFA CHAPTER	2	622642	870336	Tamiami	0	4	0	67
26-00077-W	CLEWISTON FFA CHAPTER	3	623944	869486	Tamiami	0	4	0	42
26-00077-W	CLEWISTON FFA CHAPTER	4	622253	871180	Tamiami	0	6	30	40
26-00077-W	CLEWISTON FFA CHAPTER	5	622068	872932	Tamiami	0	6	30	45
26-00077-W	CLEWISTON FFA CHAPTER	6	622223	873651	Tamiami	0	6	30	45
26-00676-W	CLEWISTON FIELD STATION AT S-2	Well 2	748835	860241	Aquifer	1,925	4	35	50
26-00676-W	CLEWISTON FIELD STATION AT S-2	1	689144	872904	Aquifer	15,401	4		90
26-00572-W	CLEWISTON MILL COMPLEX	PROPOSED WELL	677767	874328	Tamiami	125,134	10	50	70
26-00582-W	CLEWISTON/LABELLE SCHOOLS	CHS WELL #2	680846	875463	Tamiami	11,551	2	90	120
26-00582-W	CLEWISTON/LABELLE SCHOOLS	CHS WELL #3	679821	875391	Tamiami	11,551	2	80	120
26-00582-W	CLEWISTON/LABELLE SCHOOLS	CHS WELL #1	680841	875840	Tamiami	25,027	4	90	120
26-00383-W	COTTON CITRUS	N	628637	851662	Tamiami	77,005	8	80	160
26-00383-W	COTTON CITRUS	S	629012	848612	Tamiami	77,005	8	80	160
50-04241-W	COURSE	1	750218	960577	Aquifer	28,877	4	20	30
26-00817-W	CRISTO ES PARA TODOS	Well 1	614347	844053	Tamiami	4,813	4	100	200
26-00690-W	DIOCESE OF VENICE FLORIDA	1	622346	846900	Tamiami	2,310	4	100	120
26-00436-W	PACKING HOUSE	W-1	596878	884430	Aquifer	11,551	4	110	140
26-00436-W	PACKING HOUSE	W-2	596878	884430	Aquifer	11,551	4	110	140
26-00436-W	PACKING HOUSE	W	596640	884220	Aquifer	17,326	10	130	170
43-00894-W	DUPUIS RESERVE	5	794677	969277	Aquifer	1,155	4		85
43-00894-W	DUPUIS RESERVE	3	793111	968159	Aquifer	1,925	2		85
43-00894-W	DUPUIS RESERVE	4	796413	969858	Aquifer	1,925	2		85
43-00894-W	DUPUIS RESERVE	5	793243	967580	Aquifer	1,925	4		85
43-00894-W	DUPUIS RESERVE	2	799833	970808	Aquifer	3,850	3		100
43-00894-W	DUPUIS RESERVE	3	794927	969185	Aquifer	3,850	3		100
43-00894-W	DUPUIS RESERVE	1	799478	971605	Aquifer	6,353	4		85
43-00894-W	DUPUIS RESERVE	4	795045	969250	Aquifer	6,738	4		85
43-00894-W	DUPUIS RESERVE	8	793546	967422	Aquifer	15,401	4		85
26-00032-W	FARM	1	661437	878143	Aquifer	144,385	6	0	30
50-04221-W	FIRST FREE METHODIST CHURCH	1	794074	844809	Aquifer	48,128	2	149	149
50-04221-W	FIRST FREE METHODIST CHURCH	2	794074	844809	Aquifer	48,128	2	149	149
26-00013-W	FLAG HOLE	4	637037	850048	Tamiami	0	6	50	109
26-00013-W	FLAG HOLE	6	644741	851864	Tamiami	0	6	50	109
26-00013-W	FLAG HOLE	7	644167	850060	Tamiami	0	6	50	109
26-00013-W	FLAG HOLE	8	642507	849171	Tamiami	0	6	50	109
26-00013-W	FLAG HOLE	21	642041	844429	Tamiami	0	6	50	109
26-00013-W	FLAG HOLE	22	641970	847479	Tamiami	0	6	50	109
26-00013-W	FLAG HOLE	23	642883	847517	Tamiami	0	6	50	109
26-00013-W	FLAG HOLE	24	637682	842155	Tamiami	0	6	50	109
26-00013-W	FLAG HOLE	25	640166	840376	Tamiami	0	6	50	109
26-00013-W	FLAG HOLE	26	639109	842099	Tamiami	0	6	50	109
26-00013-W	FLAG HOLE	27	640154	842174	Tamiami	0	6	50	109
26-00013-W	FLAG HOLE	28	639014	840257	Tamiami	0	6	50	109
26-00013-W	FLAG HOLE	29	636852	838334	Tamiami	0	6	50	109
26-00013-W	FLAG HOLE	30	636679	841096	Tamiami	0	6	50	109
26-00013-W	FLAG HOLE	32	645069	840188	Tamiami	0	6	50	109
26-00013-W	FLAG HOLE	36	642161	833040	Tamiami	0	6	50	109
26-00013-W	FLAG HOLE	37	641277	834682	Tamiami	0	6	50	109
26-00013-W	FLAG HOLE	46	644916	830893	Tamiami	0	8	50	109
26-00013-W	FLAG HOLE	15	634255	844385	Tamiami	0	8	0	0
26-00013-W	FLAG HOLE	16	634147	843327	Tamiami	0	8	0	0
26-00013-W	FLAG HOLE	18	640185	843013	Tamiami	0	8	0	0
26-00013-W	FLAG HOLE	33	642018	838384	Tamiami	0	8	0	0
26-00013-W	FLAG HOLE	34	644604	835659	Tamiami	0	8	0	0
26-00013-W	FLAG HOLE	35	644591	832960	Tamiami	0	8	0	0
26-00013-W	FLAG HOLE	38	647285	835703	Tamiami	0	8	0	0
26-00013-W	FLAG HOLE	39	647338	833398	Tamiami	0	8	0	0
26-00013-W	FLAG HOLE	41	649787	835954	Tamiami	0	8	0	0

PERMIT NO	PROJECT NAME	NAME	X	Y	AQUIFER	PUMP CAPACITY (cfd)	WELL DIAMETER (in)	CASED DEPTH (ft)	WELL DEPTH (ft)
26-00013-W	FLAG HOLE	3	639390	848852	Tamiami	0	8	0	0
26-00013-W	FLAG HOLE	10	640546	851652	Tamiami	0	8	0	0
26-00013-W	FLAG HOLE	11	640465	849171	Tamiami	0	8	0	0
26-00013-W	FLAG HOLE	12	647130	848971	Tamiami	0	8	0	0
26-00013-W	FLAG HOLE	13	634207	847248	Tamiami	0	8	0	0
26-00013-W	FLAG HOLE	31	644496	842174	Tamiami	0	6	50	109
26-00013-W	FLAG HOLE	9	647219	851808	Tamiami	0	8	0	0
26-00013-W	FLAG HOLE	14	634255	845977	Tamiami	0	8	0	0
26-00013-W	FLAG HOLE	5	642197	851889	Tamiami	0	6	50	109
26-00013-W	FLAG HOLE	40	649393	833085	Tamiami	0	8	0	0
26-00013-W	FLAG HOLE	2	639480	851470	Tamiami	96,257	6	50	64
26-00013-W	FLAG HOLE	17	639396	847505	Tamiami	96,257	6	50	109
26-00013-W	FLAG HOLE	19	644777	847464	Tamiami	96,257	6	50	109
26-00013-W	FLAG HOLE	20	644066	844441	Tamiami	96,257	6	50	109
26-00013-W	FLAG HOLE	1	637085	851720	Tamiami	96,257	6	50	64
50-07066-W	GLADES DAY SCHOOL, INC.	Well 1	766539	858398	Aquifer	19,251	6	30	40
50-01646-W	GLADES SUGAR HOUSE	N.W.S.W	770626	862409	Aquifer	77,005	10	14	30
50-01646-W	GLADES SUGAR HOUSE	S.W.S.W	770626	862211	Aquifer	77,005	10	14	30
50-01628-W	GLADEVIEW - IRRIGATION WELL	1	824024	851548	Aquifer	38,503	2	30	50
22-00217-W	GOLF HAVEN UNIT 2	1	581522	892240	Aquifer	19,251	8	115	146
22-00217-W	GOLF HAVEN UNIT 2	2	581214	889112	Aquifer	19,251	8	115	146
50-03512-W	GOVE GLADEVIEW ELEMENTARY SCHOOL	WELL	760190	849250	Aquifer	9,626	4	30	50
50-02741-W	GREENACRES BRANCH LIBRARY	1	779072	833115	Aquifer	5,775	2	90	100
26-00777-W	DIVISION	Well 1	607447	865791	Tamiami	3,850	4	110	130
26-00777-W	DIVISION	Well 2	607786	865806	Tamiami	3,850	4	100	130
26-00777-W	DIVISION	Well 3	607910	865813	Tamiami	3,850	4	110	130
26-00747-W	GUN RANGE TRAINING FACILITY	WELL#1	589215	880859	Aquifer	6,738	4	60	205
26-00826-W	HERB'S FISH FARM	1	605968	865156	Aquifer	4,813	4	90	110
26-00826-W	HERB'S FISH FARM	2	605819	864826	Aquifer	9,626	4	90	110
26-00826-W	HERB'S FISH FARM	3	605950	864810	Aquifer	9,626	4	90	110
26-00751-W	HOLIDAY INN - CLEWISTON	WELL#1	672533	879526	Aquifer	13,476	4	130	150
22-00334-W	INDIAN HILLS FIRE DEPARTMENT	WELL#1	590845	893336	Aquifer	9,626	4	140	160
43-00041-W	INDIANTOWN COMPANY	W-4	828575	976941	Aquifer	19,251	10	115	115
43-00041-W	INDIANTOWN COMPANY	W-5	827805	977474	Aquifer	28,877	8	125	125
43-00041-W	INDIANTOWN COMPANY	W-7	827520	977092	Aquifer	28,877	8	125	125
43-00041-W	INDIANTOWN COMPANY	W-5	828167	977223	Aquifer	38,503	8	125	125
43-01750-W	INDIANTOWN MIDDLE SCHOOL	WELL 1	826694	977584	Aquifer	28,877		Assumed to be in Layer 3A	
22-00229-W	J.J. WIGGINS YOUTH CENTER	1	617741	908330	Aquifer	11,551	4	70	100
26-00419-W	JACKMAN AND SONS RANCH B	47	664126	842692	Tamiami	96,257	14	60	80
26-00419-W	JACKMAN AND SONS RANCH B	48	667014	842692	Tamiami	96,257	14	60	80
26-00419-W	JACKMAN AND SONS RANCH B	49	669748	842638	Tamiami	96,257	14	60	80
26-00419-W	JACKMAN AND SONS RANCH B	51	671460	837397	Tamiami	96,257	14	60	80
26-00419-W	JACKMAN AND SONS RANCH B	52	664693	831993	Tamiami	96,257	14	60	80
26-00419-W	JACKMAN AND SONS RANCH B	53	667272	832155	Tamiami	96,257	14	60	80
26-00419-W	JACKMAN AND SONS RANCH B	3	662991	832101	Tamiami	163,636	12	0	180
26-00419-W	JACKMAN AND SONS RANCH B	5	668252	832101	Tamiami	163,636	12	0	180
26-00419-W	JACKMAN AND SONS RANCH B	8	670057	831615	Tamiami	163,636	12	0	180
26-00419-W	JACKMAN AND SONS RANCH B	4	662681	832047	Tamiami	167,487	6	0	0
26-00419-W	JACKMAN AND SONS RANCH B	5	663352	831993	Tamiami	167,487	6	78	110
26-00419-W	JACKMAN AND SONS RANCH B	6	668149	830859	Tamiami	167,487	6	58	78
26-00419-W	JACKMAN AND SONS RANCH B	7	667581	831993	Tamiami	167,487	6	0	0
26-00419-W	JACKMAN AND SONS RANCH B	8	670418	832101	Tamiami	167,487	6	0	0
26-00419-W	JACKMAN AND SONS RANCH B	10	671460	834155	Tamiami	167,487	6	0	0
26-00419-W	JACKMAN AND SONS RANCH B	11	667788	832588	Tamiami	167,487	6	0	0
26-00419-W	JACKMAN AND SONS RANCH B	12	668097	833236	Tamiami	167,487	6	0	0
26-00419-W	JACKMAN AND SONS RANCH B	13	666653	834047	Tamiami	167,487	6	0	0
26-00419-W	JACKMAN AND SONS RANCH B	14	662063	836694	Tamiami	167,487	6	0	0
26-00419-W	JACKMAN AND SONS RANCH B	15	662939	836802	Tamiami	167,487	6	40	62
26-00419-W	JACKMAN AND SONS RANCH B	16	663765	836802	Tamiami	167,487	6	53	85
26-00419-W	JACKMAN AND SONS RANCH B	18	663713	833884	Tamiami	167,487	6	0	0
26-00419-W	JACKMAN AND SONS RANCH B	9	671192	832804	Tamiami	167,487	6	0	0
26-00419-W	JACKMAN AND SONS RANCH B	17	662527	833830	Tamiami	167,487	6	0	0
26-00504-W	L & L RESTAURANT	1	614660	840389	Aquifer	7,701	4	180	200
26-00082-W	LABELLE PRIVATE DRAINAGE DISTRICT	B-9	605141	858790	Hawthorn	385,027	4	560	756
26-00082-W	LABELLE PRIVATE DRAINAGE DISTRICT	B-10	605141	858790	Hawthorn	385,027	12	600	800
26-00082-W	LABELLE PRIVATE DRAINAGE DISTRICT	W-9	605069	858675	Hawthorn	481,283	12	643	900
43-01889-W	LAKE POINT LLC PROPERTY	P-1	788310	961452	aquifer	577,540		Temporary Dewatering Permit (will not be modeled)	
43-01889-W	LAKE POINT LLC PROPERTY	P-2	788264	963205	aquifer	577,540		Temporary Dewatering Permit (will not be modeled)	
43-01929-W	LAKE POINT RANCHES	P-3	787270	961014	aquifer	192,513		Assumed to be in Layer 3A	
43-01929-W	LAKE POINT RANCHES	P-4	790078	961014	aquifer	192,513		Assumed to be in Layer 3A	
43-01929-W	LAKE POINT RANCHES	P-5	790760	960177	aquifer	192,513		Assumed to be in Layer 3A	
43-01929-W	LAKE POINT RANCHES	P-1	787874	963865	aquifer	577,540		Temporary Dewatering Permit (will not be modeled)	
43-01929-W	LAKE POINT RANCHES	P-2	787979	964977	aquifer	577,540		Temporary Dewatering Permit (will not be modeled)	
22-00348-W	LIPSICK SANDMINE	Dewatering Pump-1	618604	909069	aquifer	192,513		Assumed to be in Layer 3A	
22-00348-W	LIPSICK SANDMINE	Dewatering Pump-2	618604	909069	aquifer	192,513		Assumed to be in Layer 3A	
22-00348-W	LIPSICK SANDMINE	Dewatering Pump-3	618604	909069	aquifer	1,155,080		Assumed to be in Layer 3A	
50-02632-W	LUCERNE HOMES EAST	1	779072	829115	Aquifer	5,775	2	60	70
50-01891-W	LUCERNE HOMES EAST SWIM CLUB	1	779072	829115	Aquifer	4,813	2	80	90
22-00237-W	LUNDY PRESLEY CITRUS	WELL 1	617440	907355	Aquifer	163,636	10	30	90
43-00022-W	MARTIN COUNTY POWER PLANT	10	791637	971322	Aquifer	16,364	4	115	120
26-00518-W	MARY LOU GENERAL STORE	2	615186	874311	Tamiami	3,850	4	120	140
26-00744-W	MC DONALDS RESTAURANT	WELL#1	674053	879982	Aquifer	5,775	4	100	120
26-00389-W	MEJIA GROVE	1	631802	850272	Tamiami	28,877		Permit Expired (will not be modeled)	
26-00691-W	MILLON FAMILY	1	600099	862927	Tamiami	17,326	4	80	100
26-00691-W	MILLON FAMILY	3	600444	863011	Aquifer	17,326	4	20	40
50-02770-W	MOBIL SERVICE STATION #02-E66	1	762072	829115	Unspecified	24,064	2	35	40
50-01844-W	MOESLY NURSERIES, INC.	1	784072	829115	Aquifer	96,257	4	70	80
22-00359-W	MOORE HAVEN PLANT	Well 1	620786	904442	Aquifer	9,626	4	21	27
26-00450-W	O'CONNOR GROVE	1	602657	860224	Aquifer	173,262	8	300	450
50-03147-W	OSCEOLA COGENERATION PLANT	SW1	801117	907240	Aquifer	28,877		Permit Expired (will not be modeled)	
50-03147-W	OSCEOLA COGENERATION PLANT	SW2	801097	906116	Aquifer	28,877	10	50	80
50-03147-W	OSCEOLA COGENERATION PLANT	SW3	802257	906120	Aquifer	28,877	10	50	80
50-05733-W	SR 98	W-1	803017	905746	Aquifer	13,861	2		50
50-07615-W	PACKING HOUSE	Well 1	765815	863800	Aquifer	24,064	8	70	80
50-07615-W	PACKING HOUSE	Well 2	766338	863800	Aquifer	24,064	8	70	80
50-03880-W	PAHOKEE CLUSTER	RW-2	767422	906220	Aquifer	9,626		Permit Expired (will not be modeled)	
50-03880-W	PAHOKEE CLUSTER	RW-3	767437	906262	Aquifer	9,626	5	0	15
50-03880-W	PAHOKEE CLUSTER	RW-1	767348	906146	Aquifer	38,503	5	0	15
50-04288-W	INSTALL	1	757801	852554	Aquifer	30,802	6	60	70
50-03276-W	FACILITY	1	858137	854662	Aquifer	10,588	2	75	78
50-04654-W	TOWER	1	855337	854795	Aquifer	2,888	2	21	41
50-05906-W	PELICAN LAKE VILLAGE	Pelican Lake Village Well 1	782605	901201	Aquifer	11,551	6	95	100
50-02377-W	PINE RIDGE SOUTH VILLAGE 2	0	784072	829115	Aquifer	8,663	2	60	63
50-02199-W	PINE RIDGE VILLAGE	1	784072	829115	Aquifer	7,701	2	90	100
43-01079-W	PORT MAYACA CEMETERY IRRIGATION	1	791679	966886	Aquifer	4,813	2	90	90
43-01079-W	PORT MAYACA CEMETERY IRRIGATION	1	791679	966886	Aquifer	4,813	2	90	90

PERMIT_NO	PROJECT_NAME	NAME	X	Y	AQUIFER	PUMP CAPACITY (cfd)	WELL_DIAMETER (in)	CASED_DEPTH (ft)	WELL_DEPTH (ft)
43-01924-W	PORT MAYACA YACHT CLUB	1	789714	968344	aquifer	481,283	Temporary Dewatering Permit (will not be modeled)		
43-01924-W	PORT MAYACA YACHT CLUB	2	789877	968344	aquifer	481,283	Temporary Dewatering Permit (will not be modeled)		
50-05754-W	CORPORATION	Well 1	791288	864537	Aquifer	0	4		18
50-05754-W	CORPORATION	Well 2	791299	864537	Aquifer	3,850	4	30	40
26-00115-W	RANCH A	54	846155	831186	Tamiami	96,257	12	60	80
26-00115-W	RANCH A	55	849837	831029	Tamiami	96,257	12	60	80
26-00115-W	RANCH A	20	660471	836605	Tamiami	128,984	6	46	69
26-00115-W	RANCH A	21	660494	835684	Tamiami	128,984	6	0	0
26-00115-W	RANCH A	22	659518	834299	Tamiami	128,984	6	50	82
26-00115-W	RANCH A	24	656097	838722	Tamiami	128,984	6	0	0
26-00115-W	RANCH A	25	655031	838534	Tamiami	128,984	6	45	79
26-00115-W	RANCH A	26	654147	838534	Tamiami	128,984	6	0	0
26-00115-W	RANCH A	27	653248	838534	Tamiami	128,984	6	0	0
26-00115-W	RANCH A	29	651435	838461	Tamiami	128,984	6	52	86
26-00115-W	RANCH A	30	651671	841137	Tamiami	128,984	6	0	0
26-00115-W	RANCH A	31	652517	841122	Tamiami	128,984	6	0	0
26-00115-W	RANCH A	32	653568	841137	Tamiami	128,984	6	41	68
26-00115-W	RANCH A	33	654718	841137	Tamiami	128,984	6	0	0
26-00115-W	RANCH A	34	656075	840143	Tamiami	128,984	6	0	0
26-00115-W	RANCH A	35	654764	840136	Tamiami	128,984	6	0	0
26-00115-W	RANCH A	36	654109	846321	Tamiami	128,984	6	0	0
26-00115-W	RANCH A	38	651473	843559	Tamiami	128,984	6	0	0
26-00115-W	RANCH A	39	655290	844400	Tamiami	128,984	8	0	0
26-00115-W	RANCH A	40	655526	843116	Tamiami	128,984	8	82	122
26-00115-W	RANCH A	41	652501	845110	Tamiami	128,984	8	0	0
26-00115-W	RANCH A	42	651473	846713	Tamiami	128,984	6	43	77
26-00115-W	RANCH A	43	653850	846735	Tamiami	128,984	6	0	0
26-00115-W	RANCH A	44	656943	846437	Tamiami	128,984	6	46	80
26-00115-W	RANCH A	45	657911	844806	Tamiami	128,984	8	0	0
26-00115-W	RANCH A	46	649751	845437	Tamiami	128,984	8	0	0
26-00115-W	RANCH A	48	655282	833110	Tamiami	128,984	6	0	0
26-00115-W	RANCH A	23	658010	834270	Tamiami	128,984	8	0	0
26-00115-W	RANCH A	28	652258	838432	Tamiami	128,984	6	0	0
26-00115-W	RANCH A	37	654117	843949	Tamiami	128,984	6	0	0
26-00730-W	RIDGDILL AND SON INC	Pump 1	686080	870502	aquifer	866,310		Assumed to be in Layer 3A	
26-00730-W	RIDGDILL AND SON INC	Pump 2	686080	870197	aquifer	866,310		Assumed to be in Layer 3A	
22-00313-W	RIDGDILL PIT NO 8	1	600344	898498	aquifer	577,540		Assumed to be in Layer 3A	
26-00461-W	RIDGELAWN CEMETARY	1	683864	880265	Aquifer	19,251	6	80	85
26-00461-W	RIDGELAWN CEMETARY	1	683936	880380	Aquifer	25,027	6	80	100
43-01039-W	ROGERS QUARTERS	WELL	823986	977416	Aquifer	14,439	4	105	115
50-02452-W	SHELL STATION	1	779072	829116	Aquifer	7,701	2	65	70
50-05856-W	SIX MILE BEND LABOR HOUSING	Well 2	792509	839669	Aquifer	4,813	2	20	30
50-06460-W	EXPANSION	1	748323	844806	Aquifer	7,701	2	160	160
50-03155-W	SOUTH BAY GROWERS GARDEN	WELL	748823	848962	Aquifer	18,289	4	18	20
50-05540-W	SOUTH BAY HEAD START	1	745987	852433	Aquifer	9,626	4	20	30
26-00445-W	SOUTHERN GARDENS CITRUS	1	615885	874652	Aquifer	0	12	80	180
26-00445-W	SOUTHERN GARDENS CITRUS	2	616330	874389	Aquifer	0	12	80	180
26-00445-W	SOUTHERN GARDENS CITRUS	3	615428	874538	Aquifer	0	4	70	100
26-00736-W	AND 2	WELL #4	616358	876200	Aquifer	9,626	4	100	205
26-00675-W	SUGARLAND PARK	2	678166	875559	Aquifer	12,513	2	90	120
26-00675-W	SUGARLAND PARK	4	678128	876300	Aquifer	12,513	2	90	120
26-00675-W	SUGARLAND PARK	1	678276	874968	Aquifer	13,476	4	90	120
26-00675-W	SUGARLAND PARK	3	678276	875707	Aquifer	13,476	4	90	120
26-00675-W	SUGARLAND PARK	5	679200	875465	Aquifer	13,476	4	90	120
26-00675-W	SUGARLAND PARK	6	679274	875042	Aquifer	13,476	4	90	120
26-00822-W	SUPER PRIMO STATION	WELL 1	687934	874441	Aquifer	11,551	4	80	100
26-00687-W	SUPERSTOP REMEDIAL ACTION	1	680966	879858	Aquifer	1,444	4	3	16
26-00687-W	SUPERSTOP REMEDIAL ACTION	2	680953	879858	Aquifer	1,444	4	3	16
26-00687-W	SUPERSTOP REMEDIAL ACTION	3	680946	879846	Aquifer	1,444	4	3	16
26-00687-W	SUPERSTOP REMEDIAL ACTION	4	680967	879846	Aquifer	1,444	4	3	16
26-00024-W	WATER TREATMENT PLANT	Well 2	676365	872113	Tamiami	164,011	12	112	155
26-00024-W	WATER TREATMENT PLANT	Well 3	678136	871813	Tamiami	164,011	12	112	155
26-00601-W	IRRIGATION	"6"" WELL"	677069	879907	Tamiami	0	6	80	80
26-00601-W	IRRIGATION	"8"" WELL"	677297	879942	Tamiami	77,005	8	80	80
26-00733-W	US SUGAR RESEARCH DEPT	WELL #1	675380	881430	Aquifer	11,551	2	80	100
50-04255-W	REHABILITATION	W-1	748567	844771	Aquifer	46,203	8	100	100
50-03458-W	WEST PALM BEACH FIELD STATION	G-310	837155	823320	Aquifer	3,850	1		40
43-01294-W	YMCA INDIANTOWN	1	826421	977479	Aquifer	5,775	2	80	100
50-03487-W	MUSEUM	1	761737	831562	Aquifer	13,476	6	18	20

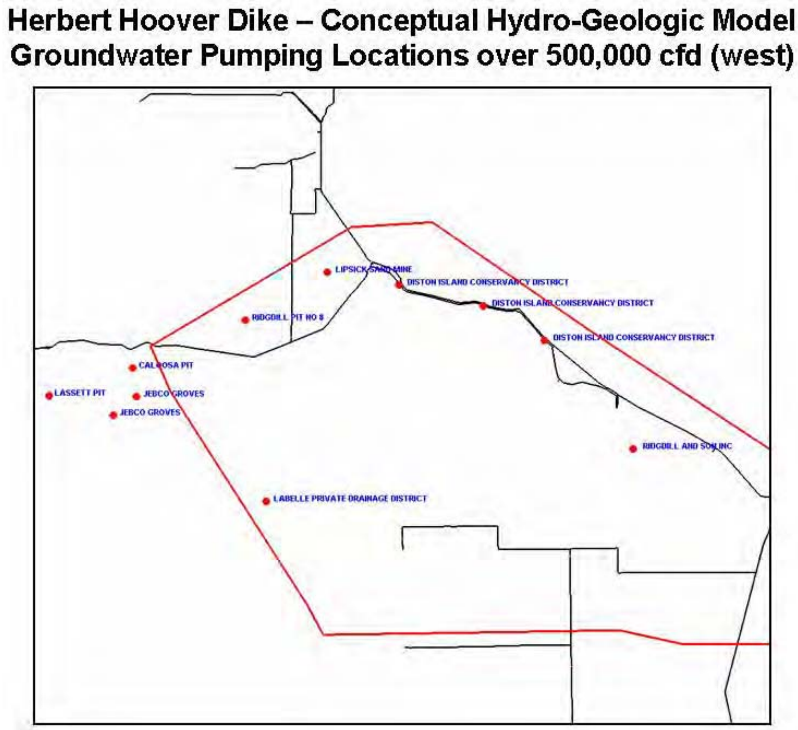

Figure 38. Locations of groundwater pumping gages with permit capacities greater than 500,000 cfd in west part the HHD Phase 1A model.

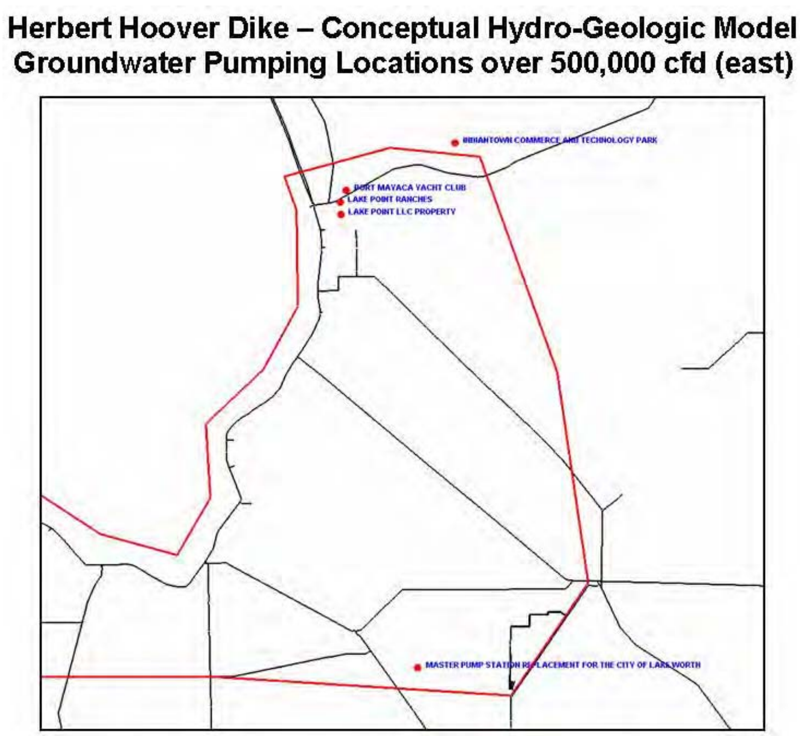

Figure 39. Locations of groundwater pumping gages with permit capacities greater than 500,000 cfd in east part the HHD Phase 1A model.

LIPSICK SAND MINE: This well cluster is located in Glades County in the western portion of the Phase 1A model domain (Figure 38). The permit indicates that these wells are used for dewatering operations. One large capacity and two lower capacity wells are located in this general location. The larger pump has a capacity of 1,155,080 cfd, while the two smaller pumps have capacities of 192,513 cfd, each. The depths of these wells are unknown; however, based on the available data, water is pumped from the water table aquifer. For the HHD Phase 1A model, the pumping was assumed to be distributed vertically across the nodes of the Layer 3A material. Although the permit for the larger capacity well will expire in April 2008, this well field was incorporated into the model using a maximum pumping rate of 1,540,106 cfd (the sum of the pump capacity from all three wells).

DISTON ISLAND CONSERVANCY DISTRICT: This group of eight pumps is located in Glades and Hendry Counties to the southwest of Lake Okeechobee (Figure 38). These pumps appear to be operated as part of the Florida drainage district program allowed under Florida statues to drain and reclaim the lands within their jurisdiction. The withdraw location for these pumps is not definitively known; however, based on information from SAJ-EN-WM these pumps withdraw water from surface water bodies, not groundwater. As such, these pumps were not included in the model.

RIDGDILL AND SON INC: This well cluster is located in Hendry County, south of Clewiston, Florida (Figure 38). The permit indicates that these wells are used to dewater for shell rock mining operations. Two large capacity wells are located in this general location, each with a capacity of 866,310 cfd. The depths of these wells are unknown; however, based on the available data, water is pumped from the water table aquifer. For the HHD Phase 1A model, the pumping was assumed to be distributed vertically across the nodes of the Layer 3A material. Although the permit for these wells will expire in October 2009, this well field was incorporated into the model using a maximum combined pumping rate of 1,732,620 cfd.

LAKE POINT LLC PROPERTY: This cluster of two wells is located in Martin County, in the northeast portion of the Phase 1A model domain (Figure 39). The permit indicates that these wells are for a one year

dewatering permit that will expire in May 2007. Since these are not permanent wells, they were not included in the HHD Phase 1A model.

LAKE POINT RANCHES: This cluster of two wells is located in Martin County, in the northeast portion of the HHD Phase 1A model domain (Figure 39). The permit indicates that these wells are for a two year construction dewatering permit that will expire in October 2008. Because these are not permanent wells, they were not included in the Phase 1A model.

PORT MAYACA YACHT CLUB: This cluster of two wells is located in Martin County, in the northeast portion of the HHD Phase 1A model domain (Figure 39). The permit indicates that these wells are for a one year construction dewatering permit that will expire in October 2007. Because these are not permanent wells, they were not included in the Phase 1A model.

MASTER PUMP STATION REPLACEMENT FOR THE CITY OF LAKE WORTH: This cluster of two wells is located in Palm Beach County, in the southeast portion of the HHD Phase 1A model domain (Figure 39). The permit indicates that these wells are for construction dewatering to be done in conjunction with the replacement of a sewer pump station. This permit expired in April 2006. Because these were not permanent wells and no longer appear to be operational, they were not included in the Phase 1A model.

INDIANTOWN COMMERCE AND TECHNOLOGY PARK: This cluster of eight wells is located in Martin County, to the northeast of the HHD Phase 1A model domain (Figure 39). The permit indicates that these wells were used for dewatering operations for 204 d in relation to a permit issued in December 06. Because these are not permanent wells and no longer appear to be operational, they were not included in the Phase 1A model.

CALOOSA PIT, LASSETT PIT, JEBCO GROVES: These wells are located in Glades County, immediately west of the HHD Phase 1A model domain (Figure 38). Caloosa pit (expired) and Lassett pit wells are for dewatering operations, while the Jebco Groves wells are for agriculture. These wells are outside of the model domain, and groundwater level data are available for model boundary conditions in this area. Therefore,

these well were not explicitly coded into the Phase 1A model, but their impacts may be seen in the assigned boundary conditions.

Everglades agricultural area (EAA)

The EAA is located to the south and east of Lake Okeechobee and is used primarily for the farming of sugar cane and other crops. Extensive surface drainage is performed in this area to maintain water levels required for agricultural activities. This surface drainage is performed through an extensive canal system coupled with surface pumping to the primary SFWMD canals in the area. Figures 40 and 41 show the water level at selected surficial groundwater and surface water gages. The data in these figures show that the water levels in PB-506_G and PB-442_G are depressed in relation to the surrounding gage. This depression in the surficial groundwater appears to be the result of surface water pumping in this area and results in the surficial groundwater flow patterns depicted in Figure 42.

Discretely modeling the EAA canal and pumping system is not within the scope of the HHD Phase 1A modeling effort and specific measurements of head and stage across the EAA were not available. However, the effects of the surface drainage in the EAA must be simulated in order to reasonably replicate the groundwater flow fields within the model. In order to approximate the EAA surface drainage, a constant head boundary condition was applied to the surface of the model in the EAA. Although the water table in this area varies according to agricultural needs, an average head of 10 ft NGVD29, i.e., ~8.7 ft NAVD88, was determined and applied to the surface nodes within the EEA in the Phase 1A model. This is approximately one to three feet below the average ground surface in most of the EAA area. However, due to the variability of the topography in this area, some locations may have up to one foot of ponded water, while other may have up to a ten foot thick unsaturated zone. The use of this boundary condition on the surface of the model should lower the heads within the EAA to a level that is reasonably consistent with observed heads in this area. To represent this complex situation, a variable-type boundary condition was employed for the surface of the model in the EAA. The application of this variable-type boundary condition within the EAA is detailed in the second last paragraph in Section 4.2. Figure 43 shows the horizontal extent of the EAA (shaded in light green). Boundary conditions for the surficial model nodes for the canals within this area was assigned based on the methodology discussed in the “Canal Data” subsection of this report.

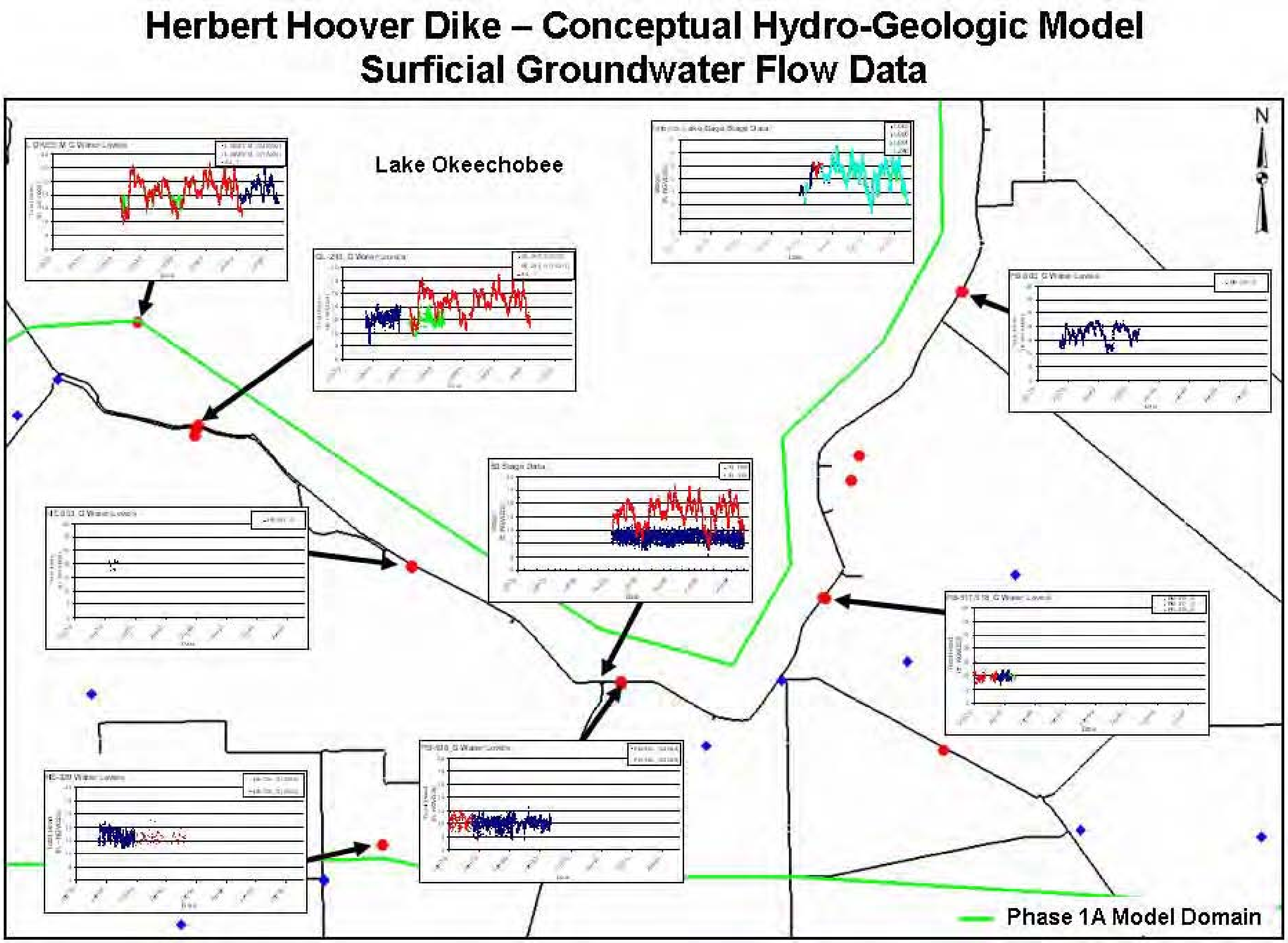

Figure 40. Water levels at selected surficial groundwater and surface water gages (1).

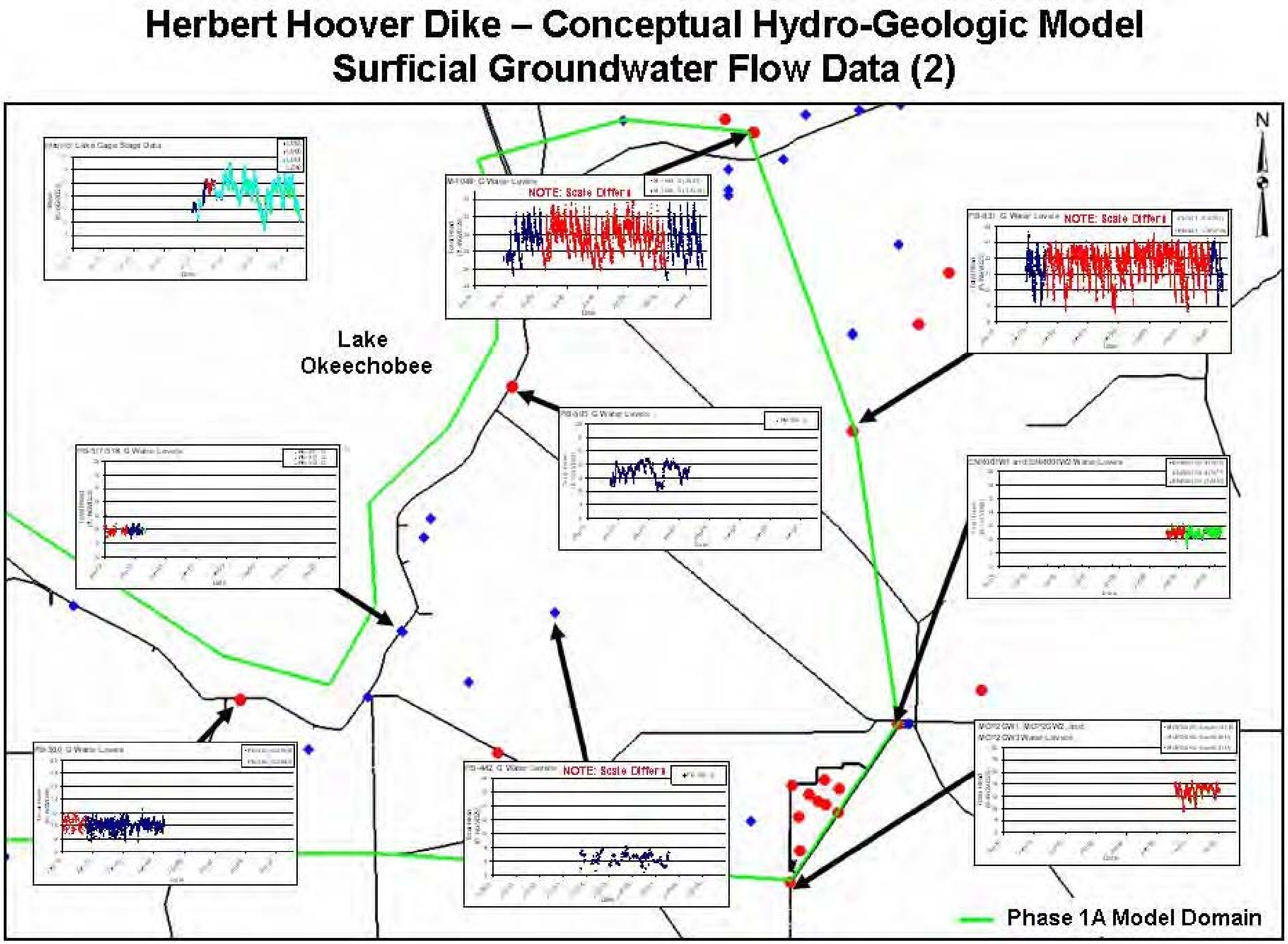

Figure 41. Water levels at selected surficial groundwater and surface water gages (2).

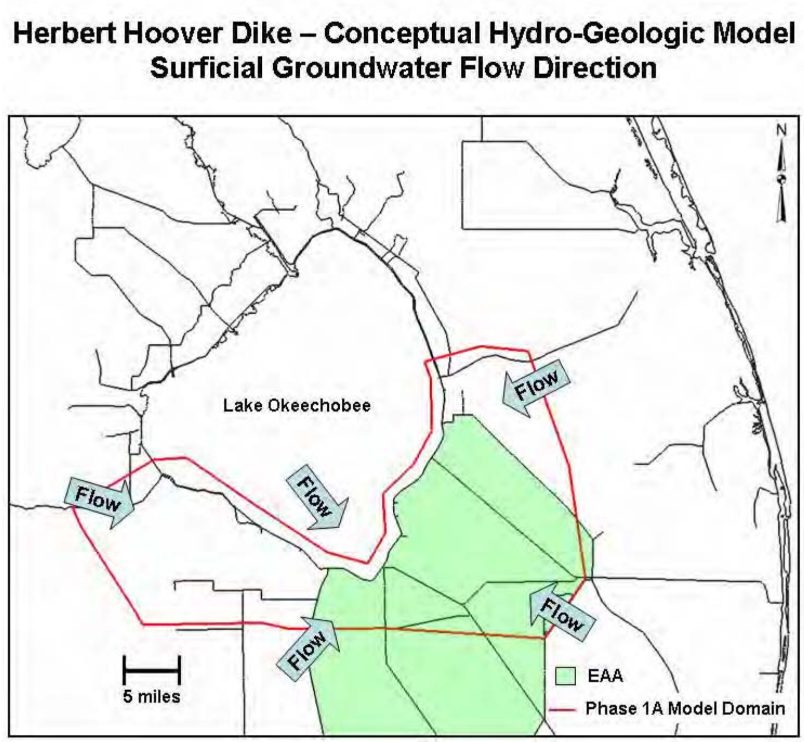

Figure 42. General surficial groundwater flow pattern resulting from surface water pumping.

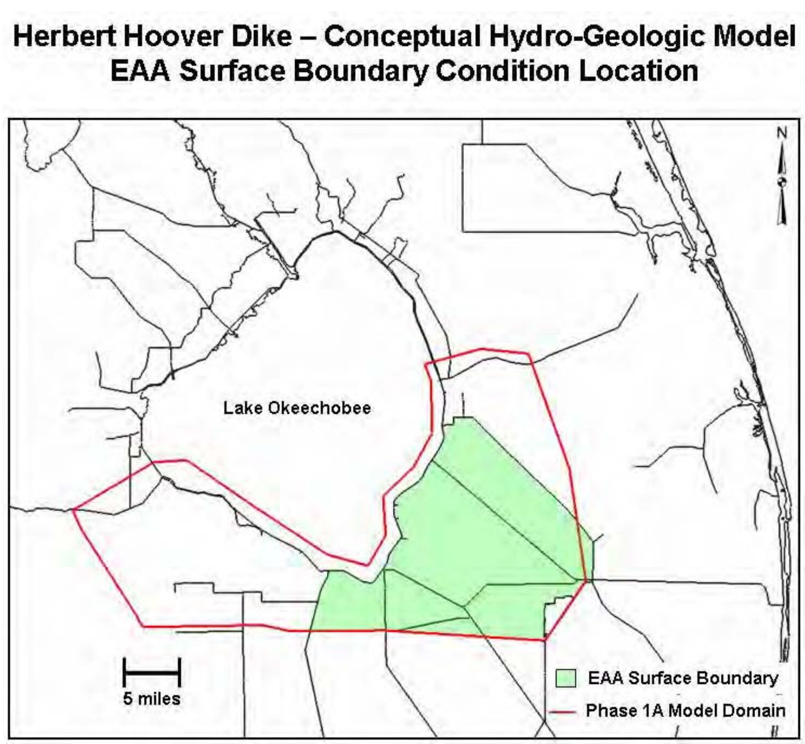

Figure 43. Horizontal extent with constant head boundary condition applied to reflect water level resulting from surface water pumping.

The QA/QC procedures for data compilation

The data collected for the HHD conceptual model were the fundamental basis upon which the WASH123D numerical model was based. Due to the importance of the data several steps were taken to assure the data collected were adequately compiled for model use. All data were either provided by SAJ or compiled from reliable sources, such as DBhydro. Once compiled, the data were checked by multiple individuals in ERDC and NAP. Data sets with obvious errors or discrepancies in location, datum, or time history variations were excluded from the conceptual model. The data compiled were then included in the Conceptual Model Report, which was provided to SAJ for review and approval. Upon SAJ's approval of the Conceptual Model Report, the construction of the HHD Phase 1A model began.

All elevation data presented in the Conceptual Model Report were in the NGVD29 datum. As discussed in Section 3.1, the data needed for sensitivity analysis and cutoff wall impact evaluation were converted from the NGVD29 datum to the NAVD88 datum before the construction of the WASH123D computational model. The data converted in this modeling task included the elevation of the triangulated irregular network (TIN) surfaces for the hydro-geological model, the groundwater total head, the surface water stage, and the pumping well screen levels. All of the data conversion was validated by multiple individuals in ERDC.

4 WASH123D-HHD Phase 1A Model Construction

Mesh configuration

Two meshes, “with project” and without project”, were generated with GMS 6.0 in the HHD Phase 1A model. The two meshes had identical numbers of nodes and elements (671,100 nodes and 1,264,412 triangular prism elements) as shown in Figure 44. Each mesh had 11 materials based on the hydrogeology of the modeled area. However, the elements associated with the cutoff wall were assigned with low-conductivity materials in the “with project” mesh, while the corresponding elements in the “without project” mesh were assigned material types accoding to the hydrogeologic units to which they belong. Figure 45 illustrates the material type differences between the two meshes along a cross-section perpendicular to the HHD in Reach 1A. It is noted that Material Type 08 was associated with the low-conductivity cutoff wall that is two-elements thick in this model, as shown in Figure 45. Therefore, they existed only in the “with project” mesh.

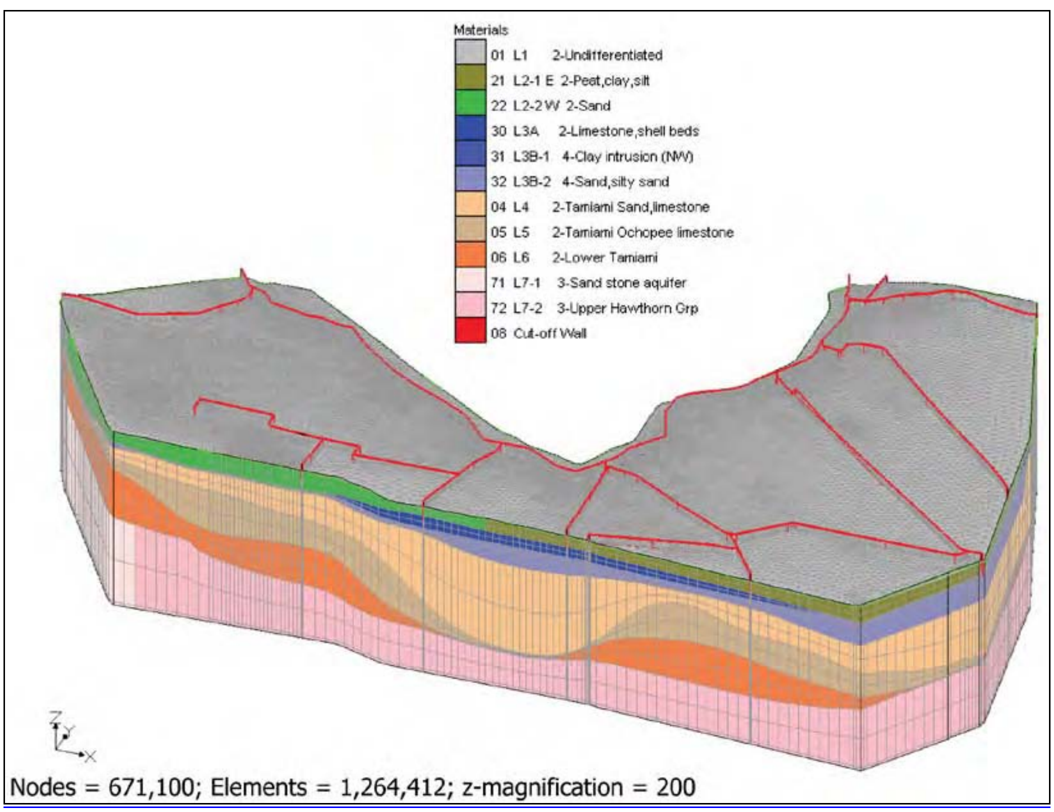

Figure 44. 3-D computational mesh of the HHD Phase 1A model.

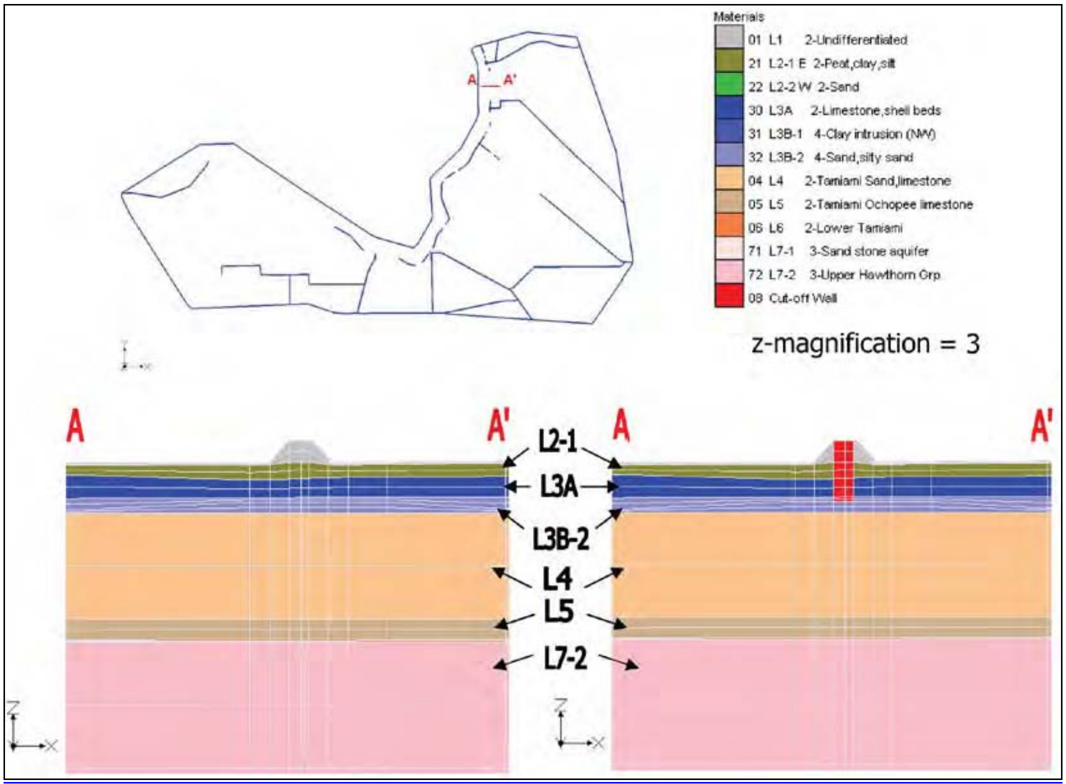

Figure 45. Material type distribution around HHD on a cross section in Reach 1A (red line, upper figure): the "without project" mesh (lower left) and the "with project" mesh (lower right).

Boundary condition setup

The compiled data used to set up the boundary conditions of the HHD Phase 1A model included (1) groundwater heads, (2) canal stages, (3) Lake Okeechobee stages, and (4) rainfall and evapotranspiration. For the sensitivity analysis considered in the HHD Phase 1A modeling effort, the high, medium, and low values were determined at each gage of groundwater head and canal stage based on the availabe historical data as described in Sections 3.6 through 3.8.

The groundwater head values were assigned to the corresponding locations to set up the head boundary condition on the side boundary faces of the computational domain (Figure 46) in GMS 6.0. Interpolation was performed to determine the boundary head values for nodes between two groundwater gages on the domain boundary. The canal stage values were assigned to the corresponding canal gage locations (red dots in Figure 47) on ground surface, i.e., the top boundary face. Interpolation was performed to determine the boundary stage values for canal-corresponding ground surface nodes between two canal gages. The groundsurface nodes associated with Lake Okeechobee, i.e., nodes north of HHD, were assigned with the

Lake Okeechobee stage data (Figure 48). Figures 49 and 50 show the high, medium, and low NGVD29 total head values at various locations to set up the boundary conditions on the side faces. Figures 51 and 52 show the NAVD88 total head values at those locations.

Figure 46. Groundwater head boundary conditions assigned at gage locations (red dots) on the side faces of the computational domain.

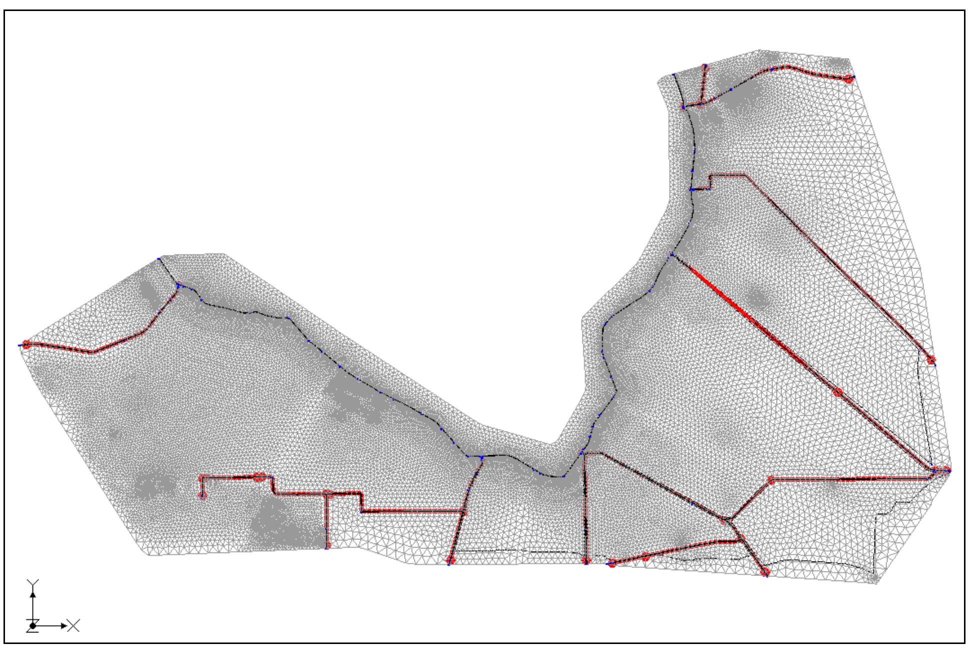

Figure 47. Canal stage boundary conditions assigned at gage locations (red dots) along canals (red arcs) on the top face of the computational domain.

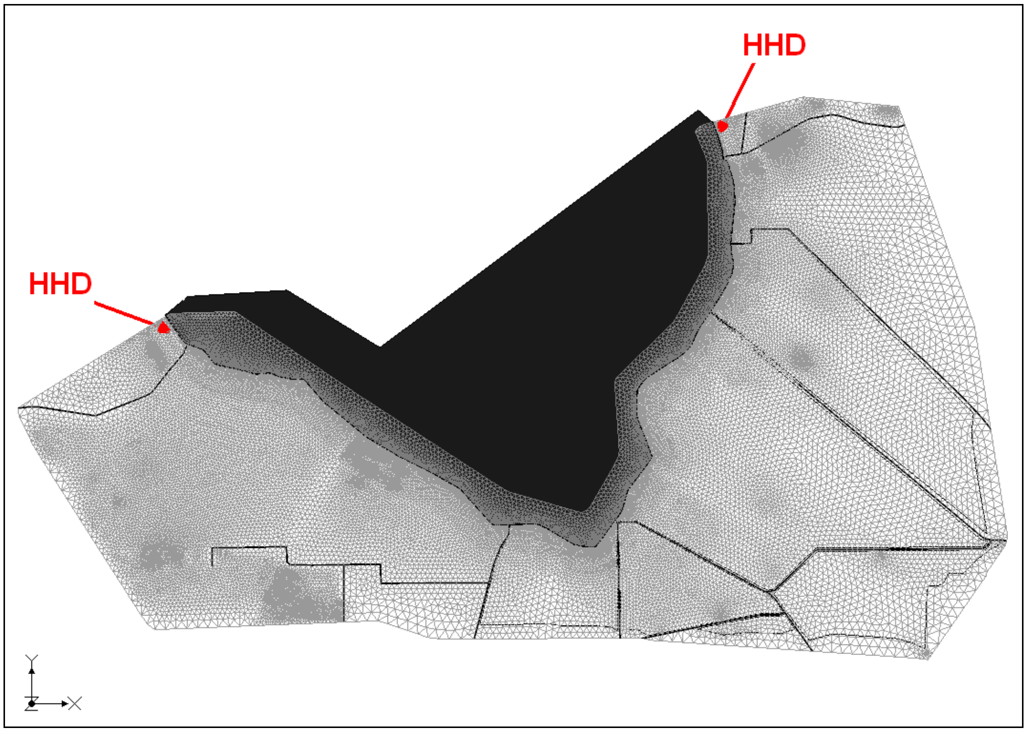

Figure 48. Ground surface nodes north of HHD, i.e., nodes associated with Lake Okeechobee, were assigned head boundary conditions with Lake Okeechobee stages.

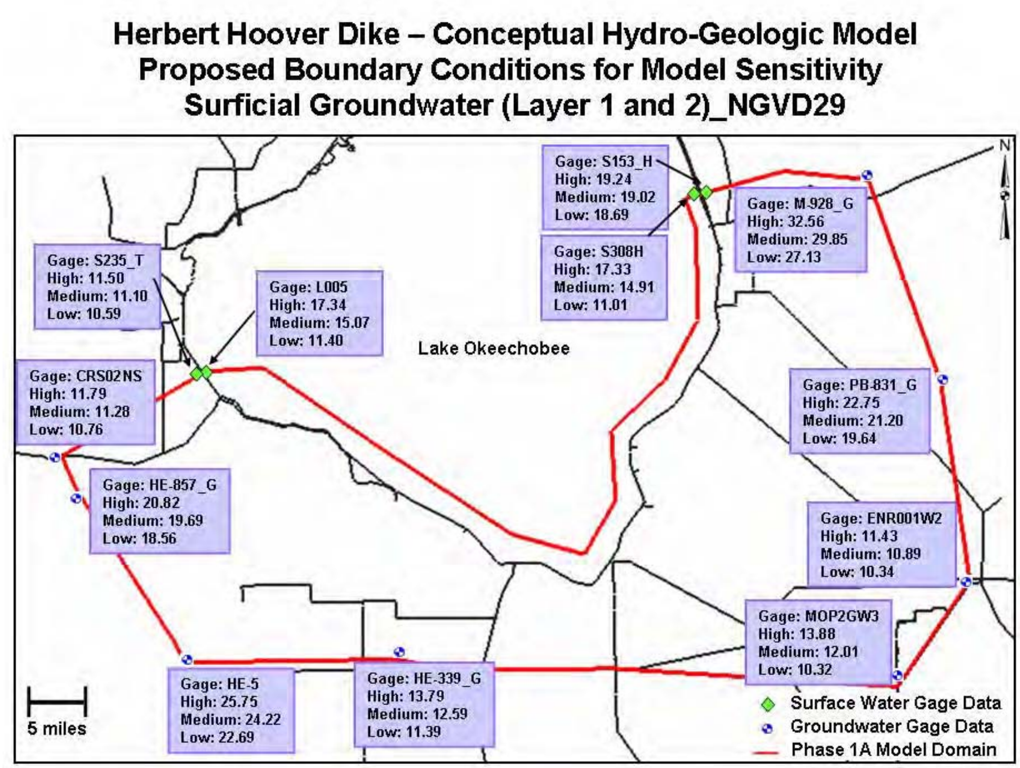

Figure 49. The high, medium, and low NGVD29 total head values at various surficial groundwater gage locations used to set up the boundary conditions on the side faces for the HHD Phase 1A model.

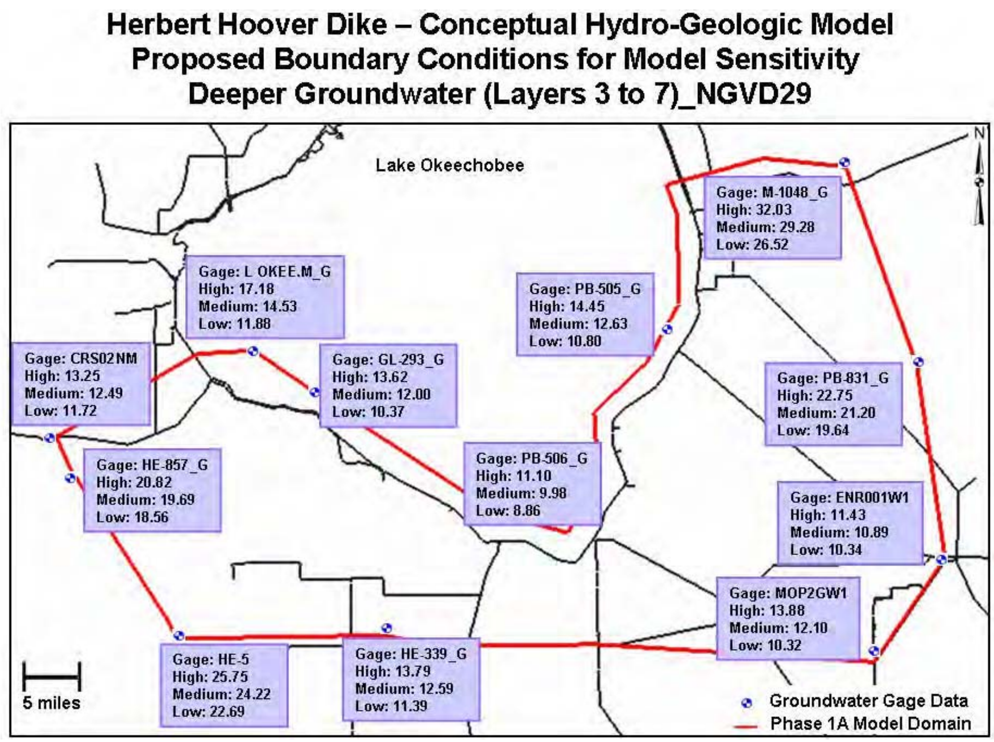

Figure 50. The high, medium, and low NGVD29 total head values at various deeper groundwater gage locations used to set up the boundary conditions on the side faces for the HHD Phase 1A model.

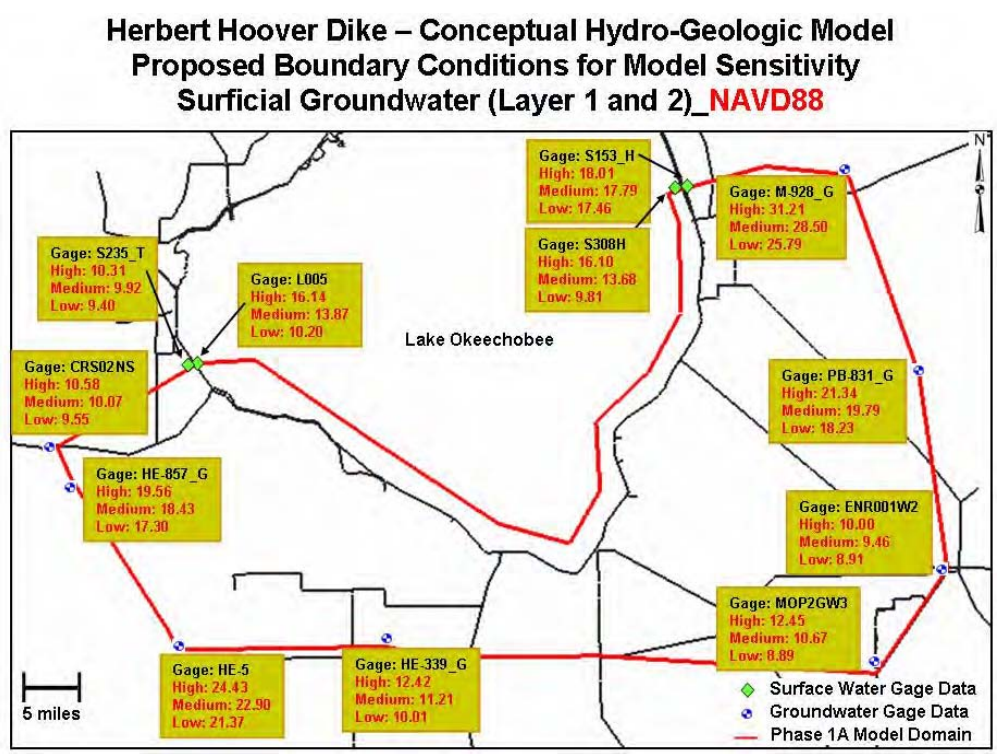

Figure 51. The high, medium, and low NAVD88 total head values at various surficial groundwater gage locations used to set up the boundary conditions on the side faces for the HHD Phase 1A model.

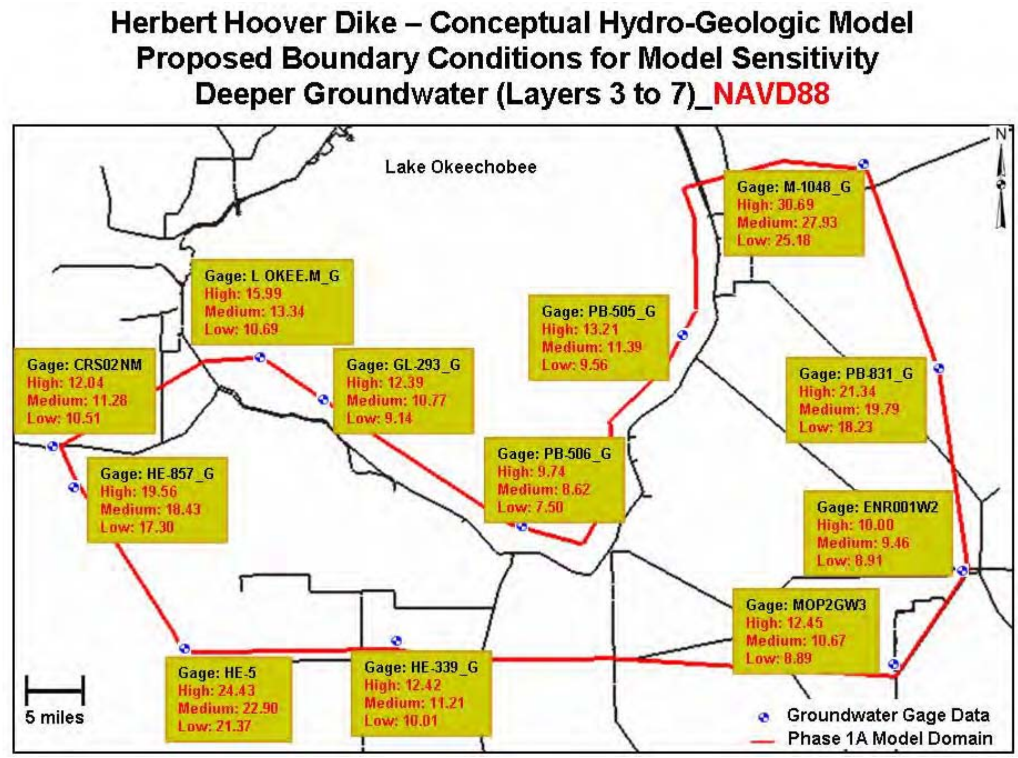

Figure 52. The high, medium, and low NAVD88 total head values at various deeper groundwater gage locations used to set up the boundary conditions on the side faces for the HHD Phase 1A model.

As discussed in Section 3.11, a variable-type boundary condition was applied to the surface of the model in the EAA. In this case, one total head value (8.7 ft NAVD88) was assigned to ground surface nodes included in the EAA area (Figure 53) when ground surface elevation is lower than the assigned total head value; otherwise, a flux boundary condition with the net recharge rate values, i.e., rainfall minus ET, as the incoming flux was applied.

The net recharge rate values, i.e., the flux boundary condition mentioned above, were also applied to the area south of HHD and other than EAA as the boundary condition (Figure 54). A maximum ponding depth of 1.5 ft was allowed to avoid unreasonable numerical results in this area.

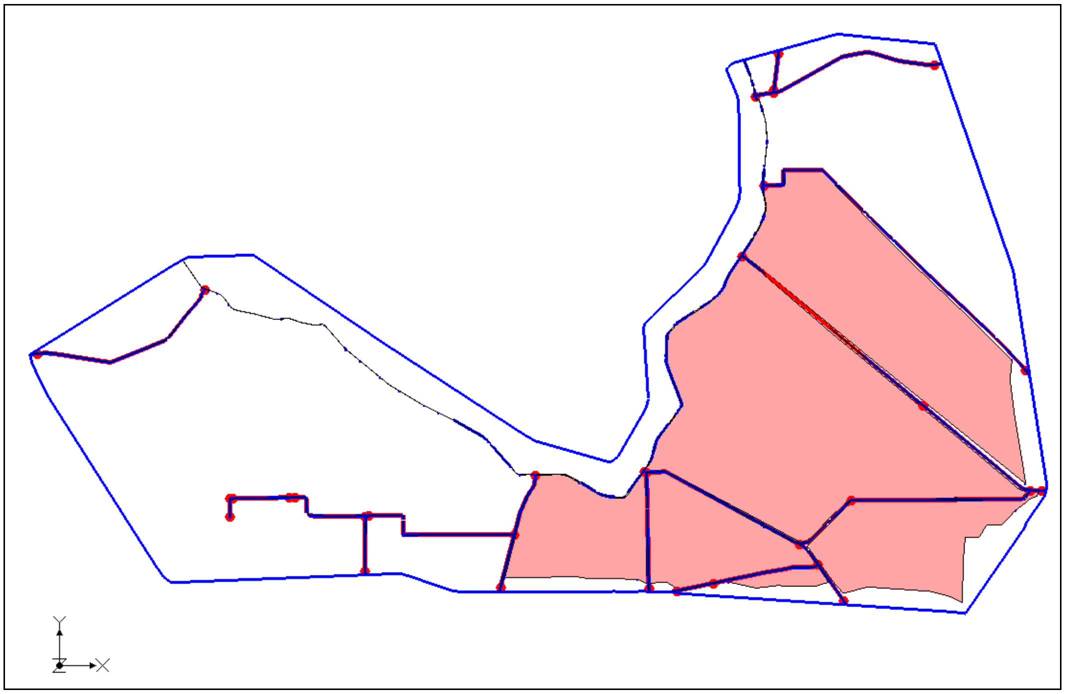

Figure 53. The EAA area (pink area) assigned with a constant total head to reflect low groundwater level observed in this area.

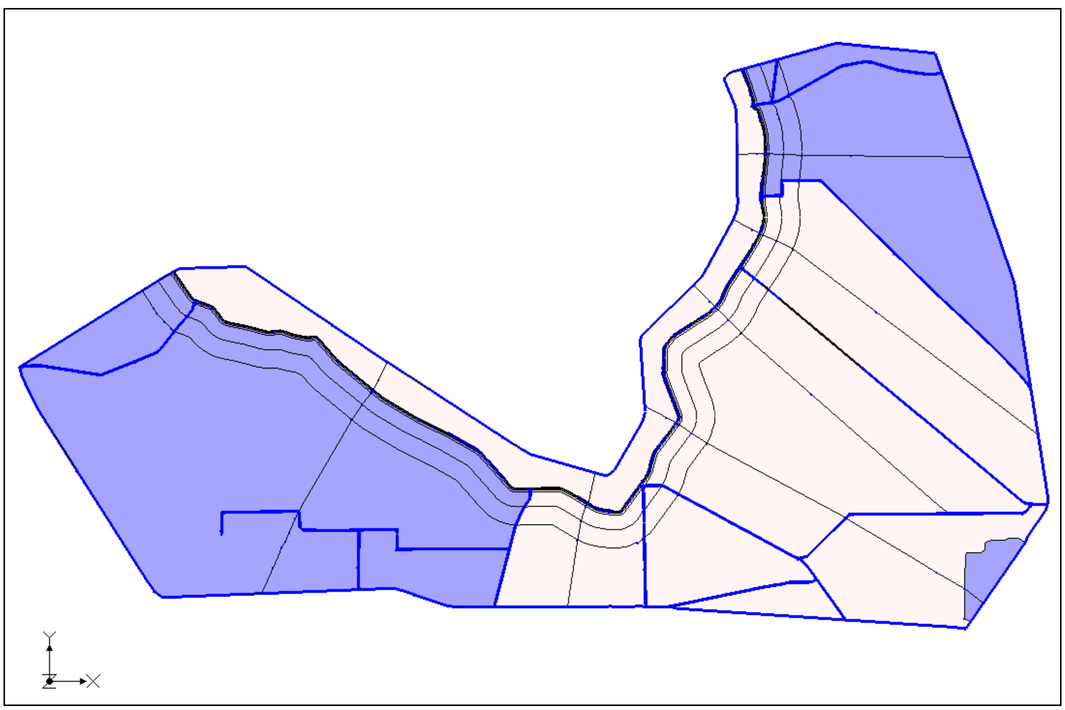

Figure 54. The area (shaded in blue) assigned with net rainfall values as flux-type boundary conditions.

Pumping setup

Figure 55 shows the locations of the pumping wells included in the HHD Phase 1A model. Table 10 lists the compiled data of the groundwater pumping wells incorporated into the HHD Phase 1A model. It is assumed that all pumps considered have sufficient power to withdraw groundwater at the rates specified even though local unsaturated zones may be generated as a result.

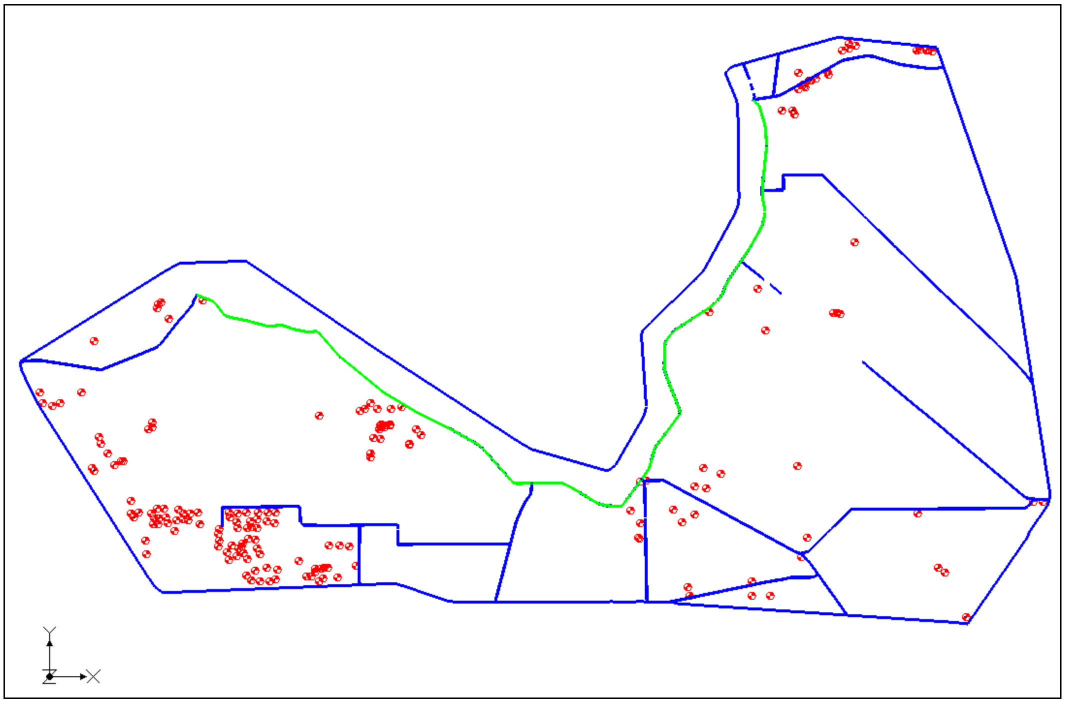

Figure 55. Locations of the pumping wells considered in the HHD Phase 1A model.

Table 10. Compiled data of the groundwater pumping wells considered in the HHD Phase 1A model (1/6).

GW_Pump	Extraction Pump	NAVD88(ft)	NAVD88(ft)	NAVD88(ft)
Name	Max Capacity(cfd)	Ground Surf_Elev	Top_Screen_Elev	Bottom_Screen_Elev
Ag_Mech_Citrus_Grove	-123209	20.81	-54.19	-99.19
Alfredo_Fabian_Combo	-17326	22.34	-77.66	-117.66
Alico_Hilliard_Lands	-96257	23.68	-66.32	-96.32
Alico_Hilliard_Lands	-96257	22.96	-67.04	-97.04
Alico_Hilliard_Lands	-96257	23.77	-66.23	-96.23
Alico_Hilliard_Lands	-96257	23.77	-66.23	-96.23
Alpat_Groves	-96257	22.39	-82.61	-102.61
Alvin_Ward_Boat_Ramp_Fac_1	-3369	15.21	-9.79	-24.79
AqualifeUSA_combo_1-2-3	-43317	20.32	-89.68	-119.68
Arbulu_1	-115508	19.65	-40.35	-60.35
Assco_Combo	-1348	9.99	5.99	-9.01
Atlantic_Sugar_Combo	-25796	9.96	-30.04	-40.04
BayRock_Groves_4	-86631	23.79	-66.21	-116.21
BayRock_Groves_5	-86631	23.61	-56.39	-116.39
BayRock_Groves_7	-86631	23.08	-105.92	-135.92
BayRock_Groves_8	-86631	21.58	-109.42	-149.42
BayRock_Groves_9	-86631	22.45	-57.55	-107.55
BayRock_Groves_10	-86631	21.57	-63.43	-103.43
BayRock_Groves_11	-86631	21.92	-63.08	-103.08
BayRock_Groves_12	-86631	21.63	-70.37	-110.37
BayRock_Groves_1	-86631	23.26	-145.74	-193.74
BayRock_Groves_6	-86631	23.35	-152.65	-192.65
BayRock_Groves_13	-86631	23	-157	-197
BayRock_Groves_15	-86631	23.79	-151.21	-191.21
BayRock_Groves_3	-86631	23.61	-108.39	-148.39
BayRock_Groves_14	-86631	21.28	-58.72	-98.72
BayRock_Groves_2	-86631	23.74	-108.26	-148.26
BelleGlade_Elem_well	-9626	14.31	-15.69	-35.69
BigLakePlaza_1	-11551	14.9	-59	-99.5
Block33-32-2	-11551	21.43	-58.57	-83.1
Block33-32-1	-23102	22.29	-57.71	-83.1
Block33-33-1	-32727	22.8	-57.2	-83.1
Booker_Park_Combo	-26952	29.63	-1.5	-3.45
Bourne_Farm_Tractor_Shop_1	-5775	10.2	-39.8	-89.8
Bryant_Sugar_Water_Treat_Plant_1	-61604	11.33	-12.67	-30.67
Chipco_Grove_1	-92406	18.42	-51.58	-151.58

GW_Pump	Extraction Pump	NAVD88(ft)	NAVD88(ft)	NAVD88(ft)
Name	Max Capacity(cfd)	Ground Surf_Elev	Top_Screen_Elev	Bottom_Screen_Elev
Citrus Nursery_2	-38503	17.66	-94.34	-127.34
Citrus Nursery_1	-57754	17.16	-94.84	-127.84
Cleghorn_Hendry_County_Farm_2	-115508	17.31	-72.69	-122.69
Cleghorn_Hendry_County_Farm_4	-115508	18.4	-68	-121.6
Clewiston_Fld_AT_S-2_Well_2	-1925	13.04	-21.96	-36.96
Clewiston_Fld_AT_S-2_1	-15401	17.16	17.16	-72.84
Clewiston_Mill_Cplx_PROPOSED_WELL	-125134	17.08	-32.92	-52.92
Clewiston-Schools_CHS_ Well-2	-11551	16.07	-73.93	-103.93
Clewiston-Schools_CHS_ Well-3	-11551	16.47	-63.53	-103.53
Clewiston-Schools_CHS_ Well-1	-25027	16.11	-73.89	-103.89
Cotton_Citrus_N	-77005	20.83	-59.17	-139.17
Cotton_Citrus_S	-77005	21.03	-58.97	-138.97
Country_Club_Everglades_Golf_1	-28877	15.1	-4.5	-14.9
Cristo Es Para Todos_Well_1	-4813	23.79	-76.21	-176.21
Diocese_of_Venice_Florida_1	-2310	22.88	-77.12	-97.12
Dole_CitrusPack_combo	-40428	20.03	-89.97	-150.31
* DupuisReserve _remove_a	-1155	19.31	-45.69	-65.69
* DupuisReserve_remove_b	-1925	19.24	-45.76	-65.76
* DupuisReserve_remove_c	-1925	20.19	-44.81	-64.81
* DupuisReserve_5	-1925	21.49	-43.51	-63.51
* DupuisReserve_2	-3850	23.07	-56.93	-76.93
* DupuisReserve_3	-3850	20.08	-59.92	-79.92
* DupuisReserve_1	-6353	22.64	-42.36	-62.36
* DupuisReserve_4	-6738	20.23	-44.77	-64.77
* DupuisReserve_8	-15401	21.97	-43.03	-63.03
Farm	-144385	13.4	13.4	-16.6
First_Free_Meth_Church_Combo	-96256	9.34	-81	-139.66
Flag_Hole_4	-96257	18.79	-31	-90.52
Flag_Hole_6	-96257	18.48	-31	-90.52
Flag_Hole_7	-96257	18.52	-31	-90.52
Flag_Hole_8	-96257	18.69	-31	-90.52
Flag_Hole_21	-96257	18.73	-31	-90.52
Flag_Hole_22	-96257	18.74	-31	-90.52
Flag_Hole_23	-96257	18.68	-31	-90.52
Flag_Hole_24	-96257	18.88	-31	-90.52
Flag_Hole_25	-96257	18.79	-31	-90.52
Flag_Hole_26	-96257	18.88	-31	-90.52
Flag_Hole_27	-96257	18.88	-31	-90.52

GW_Pump	Extraction Pump	NAVD88(ft)	NAVD88(ft)	NAVD88(ft)
Name	Max Capacity(cfd)	Ground Surf_Elev	Top_Screen_Elev	Bottom_Screen_Elev
Flag_Hole_28	-96257	18.85	-31	-90.52
Flag_Hole_29	-96257	19.79	-31	-90.52
Flag_Hole_30	-96257	19.11	-31	-90.52
Flag_Hole_32	-96257	18.71	-31	-90.52
Flag_Hole_36	-96257	19.18	-31	-90.52
Flag_Hole_37	-96257	19.24	-31	-90.52
Flag_Hole_15	-96257	19.06	-31	-90.52
Flag_Hole_16	-96257	19.11	-31	-90.52
Flag_Hole_18	-96257	18.88	-31	-90.52
Flag_Hole_33	-96257	18.98	-31	-90.52
Flag_Hole_34	-96257	18.76	-31	-90.52
Flag_Hole_35	-96257	18.81	-31	-90.52
Flag_Hole_38	-96257	18.69	-31	-90.52
Flag_Hole_39	-96257	18.67	-31	-90.52
Flag_Hole_41	-96257	18.67	-31	-90.52
Flag_Hole_3	-96257	18.94	-31	-90.52
Flag_Hole_10	-96257	16.6	-31	-90.52
Flag_Hole_11	-96257	17.49	-31	-90.52
Flag_Hole_12	-96257	18.01	-31	-90.52
Flag_Hole_13	-96257	19.18	-31	-90.52
Flag_Hole_31	-96257	18.68	-31	-90.52
Flag_Hole_9	-96257	17.71	-31	-90.52
Flag_Hole_14	-96257	19.11	-31	-90.52
Flag_Hole_5	-96257	18.85	-31	-90.52
Flag_Hole_40	-96257	18.67	-31	-90.52
Flag_Hole_2	-96257	18.89	-31.11	-45.11
Flag_Hole_17	-96257	19.13	-30.87	-89.87
Flag_Hole_19	-96257	18.56	-31.44	-90.44
Flag_Hole_20	-96257	18.68	-31.32	-90.32
Flag_Hole_1	-96257	18.81	-31.19	-45.19
GladesDaySchool_Well-1	-19251	12.27	-15	-28.5
Glades_Sugar_NWSW_SWSW-combo	-154010	14.86	0.86	-15.23
Gladeview_Irrigation_Well	-38503	8.69	-21.31	-41.31
Gove_Gladeview_Elem_School	-9626	11.83	-18.17	-38.17
Green_Acres_BrLib	-5775	8.91	-78	-91.09
Grow_Houses_combo	-11550	22.31	-77.69	-107.69
Gun_Ranch	-6738	18.54	-61.46	-186.46
Herbs_FishFarm_combo	-24065	22.91	-67.09	-87.09

GW_Pump	Extraction Pump	NAVD88(ft)	NAVD88(ft)	NAVD88(ft)
Name	Max Capacity(cfd)	Ground Surf_Elev	Top_Screen_Elev	Bottom_Screen_Elev
Holiday_Inn	-13476	15.78	-114.22	-134.22
Indian_Town_combo	-115508	32.18	-27.4	-94
Indian_Town_Mid_School	-28877	-31.8	-47	-68
JJ_Wiggins_Youth	-11551	14.03	-55.97	-85.97
J&S_RanchB_47	-96257	17.43	-42.57	-62.57
J&S_RanchB_48	-96257	18.09	-41.91	-61.91
J&S_RanchB_49	-96257	16.29	-43.71	-63.71
J&S_RanchB_51	-96257	15.5	-42	-66.6
J&S_RanchB_13	-167487	17.01	-43.3	-63
J&S_RanchB_14	-167487	17.46	-42.5	-62.5
J&S_RanchB_15	-167487	17.41	-22.59	-67.65
J&S_RanchB_16	-167487	17.35	-35.65	-67.65
J&S_RanchB_17	-167487	17.45	-42.6	-62.6
L&L_Restaurant_1	-7701	23.99	-156.01	-180
Lake_Pt_LLC_Prop_P-3	-192513	15.48	2	-18.7
Lake_Pt_LLC_Prop_P-4	-192513	19.55	2	-16.5
Lake_Pt_LLC_Prop_P-5	-192513	19.79	2	-16
LipsickSand_combo	-1540107	13.64	-14.8	-16.7
Combo_(key id=183_184_253)	-18289	8.91	-51.03	-81.03
Lundy_Presley_Citrus_WELL_1	-163636	13.52	-16.48	-76.48
Martin_Co_Power_Plant_10	-16364	23.42	-77	-96.58
Mary_Lou_Gen_Store_2-combo	-3850	21.52	-97	-127
McDonalds_Restaurant_WELL#1	-5775	16.56	-83.44	-103.44
Million_Family_1	-17326	21.03	-58.97	-78.97
Million_Family_3	-17326	21.27	1.27	-18.73
MOBIL_ServiceSta	-24064	9.9	-25.1	-30.1
Moesly_Nurseries_1-Combo	-96257	9.2	-51.1	-91.1
Moore_Haven_Plant_Well-1	-9626	13.57	-6	-13.43
Osceola_Cogeneration_Plant_SW2	-28877	8.84	-41.16	-71.16
Osceola_Cogeneration_Plant_SW3	-28877	8.97	-41.03	-71.03
Osceola_Sugar_Mill_Sta_Tower_W-1	-13861	8.65	8.65	-41.35
Packing_House_Well__combo	-48128	11.96	-54	-74
Pahokee_Cluster_RW-1-2-3_combo	-48129	16.55	16.55	1.21
PumpInstall_1	-30802	11.4	-46	-58.6
PBSO_Law_TrnFac_1	-10588	12.2	-54	-65.8
PBSO_TrnFac_CommTower_1	-2888	9.71	-11.29	-31.29
Pelican_Lake_Village_Well_1	-11551	10.12	-80	-89.88
Port_Mayaca_Cem_Irrigation_combo	-9626	19.6	-50.4	-78.4

GW_Pump	Extraction Pump	NAVD88(ft)	NAVD88(ft)	NAVD88(ft)
Name	Max Capacity(cfd)	Ground Surf_Elev	Top_Screen_Elev	Bottom_Screen_Elev
Pruitt_Tractor_Well_1-2-combo	-3850	10.27	-19.73	-29.73
Ranch_A_Primary_20	-128984	17.35	-28.65	-51.65
Ranch_A_Primary_21	-128984	17.27	-42.73	-62.73
Ranch_A_Primary_22	-128984	17.18	-32.82	-64.82
Ranch_A_Primary_24	-128984	17.58	-38	-65
Ranch_A_Primary_23	-128984	17.15	-42.42	-62.42
Ridgdill_and_Son_Pump1	-866310	14.28	-4	-14
Ridgdill_and_Son_Pump2	-866310	14.03	-4	-14
Ridgdill_Pit8	-577540	13.02	-25	-27
RidgelawnCemetary_combo	-44278	18.43	-61.57	-81.57
Rogers_Qrt	-14439	28.13	-76.87	-86.87
Six_Mile_Bend	-4813	11.27	-8.73	-18.73
South_Bay_Corr_FacExp	-7701	10.53	-118	-149.47
South_Bay_Growers_Garden	-5775	14.56	-5.4	-17.4
South_Bay_HeadStart	-9626	12.07	-7.93	-17.93
S_Gardens_Citrus_Combo_1-2-3	-144384	21	-48.24	-159.15
S_Gardens_Citrus Phase_WELL#4	-9626	21.62	-78.38	-183.38
SugarLand_2	-12513	17.09	-72.91	-102.91
SugarLand_4	-12513	17.18	-72.82	-102.82
SugarLand_1	-13476	17.24	-72.76	-102.76
SugarLand_3	-13476	17.24	-72.76	-102.76
SugarLand_5	-13476	16.88	-73.12	-103.12
SugarLand_6	-13476	16.56	-73.44	-103.44
Super_Primo_Station_WELL_1	-11551	17.73	-62.27	-82.27
SuperStop_1-2-3-4-combo	-5776	17.45	14.45	1.45
US_Sugar_Corp_Clewiston_Well_2	-154011	21.05	-90.95	-133.95
US_Sugar_Corp_Clewiston_Well_3	-154011	20.1	-91.9	-134.9
US_Sugar_Main_combo_Well_6-8	-134759	19.7	-40.3	-60.3
US_Sugar_Research_WELL_1	-11551	16.59	-61	-83.41
Wellington_Aquatic_Rehab_W-1	-46203	10.64	-66	-99.36
West_Palm_Beach_Fld_Sta_G-310	-3850	11.61	-8.39	-28.39
YMCA_IndianTown	-5775	32.05	-47.95	-67.95
Zora_Neale_Hurston_RG_Museum	-13476	9.6	-8	-10.4
Ranch_A_Primary_19_added	-128984	18.2	-42.85	-62.85
* Dupuis Reserve pumps labeled as "remove" incorrectly remained active during all pumping simulations reported herein.				
* Dupuis Reserve pump screens lengths were incorrectly set to 45-ft (rather than 20-ft) for all pumping simulations reported herein.				

Flow cross-section setup

Twenty one cross sections, seven for each reach, were proposed to and approved by SAJ for comparison of groundwater flow through them between "with project" and "without project" in the HHD Phase 1A modeling. The seven cross sections for each reach were set 50, 100, 200, 500, 1,000, 5,000, and 10,000 ft from the land-side toe of HHD in the reach. These cross sections were incorporated into the computational meshes when the meshes were constructed so that the cross sections aligned perfectly with element faces for groundwater flow computation. Figure 56 shows the 21 cross sections considered (highlighted in red).

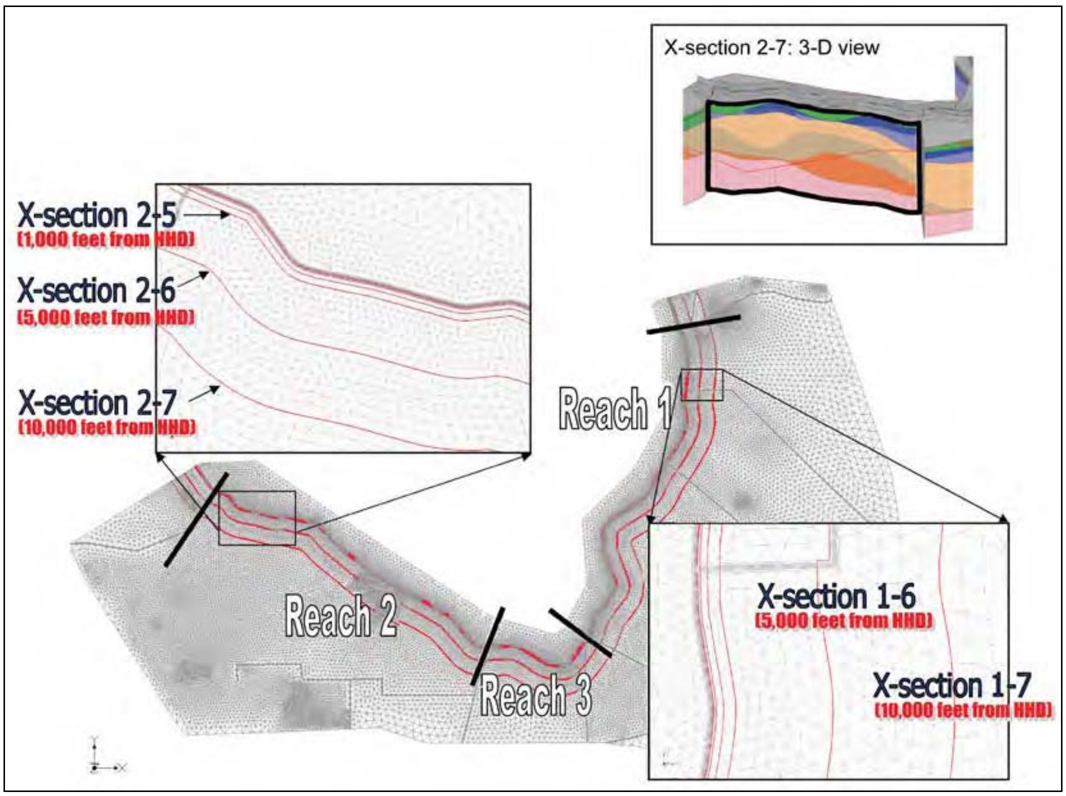

Figure 56. Twenty one cross sections, seven in each reach, accounted for in the HHD Phase 1A model.

Unsaturated soil curves

The following soil curves were adopted for all the eleven materials due to their simplicity.

$$MC = 0.11 + WC * (h + 15) \tag{2}$$

$$RC = 0.1 + 0.06 * (h + 15) \tag{3}$$

where:

MC = moisture content (L^3/L^3);
WC = water capacity (L^3/L^3L) ;
h = pressure head (L);
RC = relative conductivity (dimensionless).

Here the length unit (L) is ft.

These two equations were used to charaterize the unsaturated zone based on the following considerations:

- The unsaturated zone will play a crucial role in transient simulations, especially when surface-subsurface interaction is taken into account, in the next phase of HHD modeling.
- There is no report to suggest what unsaturated soil curves should be used.
- There is no field data that can be used to prove one set of curves are better than others.
- The aforementioned soil curves are simple, which makes the computation easier to converge when compared to other water retension curves (e.g., van Genuchten 1980).
- The aforementioned soil curves had been used in the calibration/validation and alternative evaluation in the Biscayne Bay Coastal Wetlands modeling project, and the simulation results were reasonable.

Simulation parameter

The HHD Phase 1A model is a steady-state model, which needs only an initial value of head at each computational mesh node to start the nonlinear iteration in solving the steady-state version of the Richards equation. Whatever initial heads used for steady-state computation will not affect the convergent solutions as long as the convergent criteria are set tight enough, i.e., the differences of two convergent solutions based on two different initial heads are negligible. The convergence criteria were set to 10^{-4} and 10^{-6} ft for the maximum absolute nodal head difference between two consecutive non-linear iterations and between two consecutive linear iterations, respectively, in this study. Based on studies performed for previous south Florida modeling efforts, this convergence criterion is adequate to accurately resolve the numerical flow equations for this study.

The QA/QC procedures for model construction

Two QA/QC procedures were employed during model construction to detect errors that may have occurred while entering the compiled data into GMS 6.0 for constructing the computational model. The input data files used for model runs (the files GMS 6.0 generates during model construction) were spot-checked first by comparing the input file data with the compiled data. Test model runs were then conducted, and the computed pressure heads on the boundaries with specified total head boundary conditions were compared with the compiled data again for the assurance of data correctness.

5 Results and Analysis

This project investigated how much impact the proposed cutoff wall could possibly have on groundwater flow through the 21 specified cross sections. The 3-D steady-state subsurface flow results of the "with project" simulation runs were compared with those of the corresponding "without project" simulation runs for impact analysis.

Because there were 11 subsurface materials included in the model, it will require excessive time and effort to conduct a comprehensive suite of sensitivity analysis where all combinations of high, medium, and low values of hydraulic conductivity for all materials were taken into account. Therefore, a two-stage analysis was designed and conducted to effectively achieve the purpose of this study.

In Stage 1, 46 model sensitivity runs were conducted to determine three hydrogeologic units that have more impact than the other eight units on the groundwater flow through the 21 cross sections, where the medium values of boundary condition, net recharge, and pumping were employed to represent an average hydrologic condition. As shown in Table 11, the first 23 runs were the "without project" runs, while the last 23 runs were the "with project" runs. Among the 46 runs, Runs 1 and 24 served as the base cases for the "without project" and the "with project" groups, respectively, where the medium value of hydraulic conductivity was used for each hydrogeologic unit. The other 22 runs in each group used either the high or the low value of hydraulic conductivity of a hydrogeologic unit. The sequence of model runs was arranged in a way that the sensitivity of the 21 cross-sectional flows to the hydraulic conductivities of the 11 materials was tested in order.

The high and low pumping rates and the high, medium, and low net recharge and boundary conditions were generated based on the field data made available to ERDC and were intended to be used to mimic some extreme conditions/scenarios that would cover most possible situations in practice. The high and low values of a hydraulic conductivity are the upper and lower bounds of the model parameter. Therefore, their respective computational results represent how sensitive the modeled system to the parameter would be.

Table 11. Forty six model runs included in Stage 1 analysis (i.e., sensitivity analysis on hydraulic conductivity, 1/2).

Run ID	Mesh	Net Recharge	Head BC	Pumping	Subsurface Material										
					L1	L2-1	L2-2	L3A	L3B-1	L3B-2	L4	L5	L6	L7-1	L7-2
1*	w/o project	med**	med	med	med	med	med	med	med	med	med	med	med	med	med
2	w/o project	med	med	med	high	med	med	med	med	med	med	med	med	med	med
3	w/o project	med	med	med	low	med	med	med	med	med	med	med	med	med	med
4	w/o project	med	med	med	med	high	med	med	med	med	med	med	med	med	med
5	w/o project	med	med	med	med	low	med	med	med	med	med	med	med	med	med
6	w/o project	med	med	med	med	med	high	med	med	med	med	med	med	med	med
7	w/o project	med	med	med	med	med	low	med	med	med	med	med	med	med	med
8	w/o project	med	med	med	med	med	med	high	med	med	med	med	med	med	med
9	w/o project	med	med	med	med	med	med	low	med	med	med	med	med	med	med
10	w/o project	med	med	med	med	med	med	med	high	med	med	med	med	med	med
11	w/o project	med	med	med	med	med	med	med	low	med	med	med	med	med	med
12	w/o project	med	med	med	med	med	med	med	med	high	med	med	med	med	med
13	w/o project	med	med	med	med	med	med	med	med	low	med	med	med	med	med
14	w/o project	med	med	med	med	med	med	med	med	med	high	med	med	med	med
15	w/o project	med	med	med	med	med	med	med	med	med	low	med	med	med	med
16	w/o project	med	med	med	med	med	med	med	med	med	med	high	med	med	med
17	w/o project	med	med	med	med	med	med	med	med	med	med	low	med	med	med
18	w/o project	med	med	med	med	med	med	med	med	med	med	med	high	med	med
19	w/o project	med	med	med	med	med	med	med	med	med	med	med	low	med	med
20	w/o project	med	med	med	med	med	med	med	med	med	med	med	med	high	med
21	w/o project	med	med	med	med	med	med	med	med	med	med	med	med	low	med
22	w/o project	med	med	med	med	med	med	med	med	med	med	med	med	med	high

Run ID	Mesh	Net Recharge	Head BC	Pumping	Subsurface Material										
					L1	L2-1	L2-2	L3A	L3B-1	L3B-2	L4	L5	L6	L7-1	L7-2
23	w/o project	med	med	med	med	med	med	med	med	med	med	med	med	med	low
24*	w/ project	med	med	med	med	med	med	med	med	med	med	med	med	med	med
25	w/ project	med	med	med	high	med	med	med	med	med	med	med	med	med	med
26	w/ project	med	med	med	low	med	med	med	med	med	med	med	med	med	med
27	w/ project	med	med	med	med	high	med	med	med	med	med	med	med	med	med
28	w/ project	med	med	med	med	low	med	med	med	med	med	med	med	med	med
29	w/ project	med	med	med	med	med	high	med	med	med	med	med	med	med	med
30	w/ project	med	med	med	med	med	low	med	med	med	med	med	med	med	med
31	w/ project	med	med	med	med	med	med	high	med	med	med	med	med	med	med
32	w/ project	med	med	med	med	med	med	low	med	med	med	med	med	med	med
33	w/ project	med	med	med	med	med	med	med	high	med	med	med	med	med	med
34	w/ project	med	med	med	med	med	med	med	low	med	med	med	med	med	med
35	w/ project	med	med	med	med	med	med	med	med	high	med	med	med	med	med
36	w/ project	med	med	med	med	med	med	med	med	low	med	med	med	med	med
37	w/ project	med	med	med	med	med	med	med	med	med	high	med	med	med	med
38	w/ project	med	med	med	med	med	med	med	med	med	low	med	med	med	med
39	w/ project	med	med	med	med	med	med	med	med	med	med	high	med	med	med
40	w/ project	med	med	med	med	med	med	med	med	med	med	low	med	med	med
41	w/ project	med	med	med	med	med	med	med	med	med	med	med	high	med	med
42	w/ project	med	med	med	med	med	med	med	med	med	med	med	low	med	med
43	w/ project	med	med	med	med	med	med	med	med	med	med	med	med	high	med

Run ID	Mesh	Net Recharge	Head BC	Pumping	Subsurface Material										
					L1	L2-1	L2-2	L3A	L3B-1	L3B-2	L4	L5	L6	L7-1	L7-2
44	w/ project	med	med	med	med	med	med	med	med	med	med	med	med	low	med
45	w/ project	med	med	med	med	med	med	med	med	med	med	med	med	med	high
46	w/ project	med	med	med	med	med	med	med	med	med	med	med	med	med	low

Runs 1 and 24 are the base cases for "without project" and "with project" simulation runs

** high = high value; med = medium value; low = low value

The low, medium, and high values of hydraulic conductivity for Material L1 are (0.5, 0.5, 0.5), (2.8, 2.8, 2.8), and (5, 5, 5) ft/d

The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d

The low, medium, and high values of hydraulic conductivity for Material L2-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/d

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d

The low, medium, and high values of hydraulic conductivity for Material L3B-1 are (0.5, 0.5, 0.4), (1, 1, 0.8), and (5, 5, 4) ft/d

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/d

The low, medium, and high values of hydraulic conductivity for Material L4 are (5, 5, 0.5), (10, 10, 1), and (30, 30, 3) ft/d

The low, medium, and high values of hydraulic conductivity for Material L5 are (150, 150, 12), (400, 400, 32), and (750, 750, 60) ft/d

The low, medium, and high values of hydraulic conductivity for Material L6 are (10, 10, 5), (35, 35, 17.5), and (35, 35, 17.5) ft/d

The low, medium, and high values of hydraulic conductivity for Material L7-1 are (200, 200, 20), (500, 500, 50), and (1375, 1375, 137.5) ft/d

The low, medium, and high values of hydraulic conductivity for Material L7-2 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d

In Stage 2, 96 model runs were conducted to study the change of ground-water flow through the 21 cross sections from the "without project" scenario to the "with project" scenario, where 48 runs featuring vairous combination of the high, medium, and low values of net recharge and head boundary conditions, high (permit capacity) and low (zero) pumping rates, and the three most influential hydraulic conductivities determined from the Stage 1 analysis were included in each scenario (Table 12).

To determine how sensitive the modeled system is to a factor in Stage 1 analysis, the following was considered. Suppose the response of the modeled system is expressed as a function of various factors as:

$$R = f(x_1, x_2, \ldots) \tag{4}$$

where:

R = the system response;
x_1, x_2, = factors that may influence the system response.

The change rate of the system response can then be written as

$$Rate_i = \frac{\partial f}{\partial x_i} \tag{5}$$

where:

$Rate_i$ = the system response change rate with respect to factor x_i.

When the absolute value of $Rate_i$ is larger then $Rate_j$, the system is called more sensitive to factor x_i than to factor x_j. However, it is common that different factors have different applicable ranges, which makes the sensitivity comparison with Equation 5 hard to achieve in many occasions. A dimensionless change rate as defined in Equation 6 also has been employed for sensitivity analysis.

Table 12. Ninety six model runs included in Stage 2 analysis (1/3).

Run ID	Mesh	Net Recharge	Head BC	Pumping	Subsurface Material										
					L2-1	L3A	L3B-2	L1	L2-2	L3B-1	L4	L5	L6	L7-1	L7-2
1	w/o project	high*	high	high	high	high	high	med	med	med	med	med	med	med	med
2	w/o project	high	high	high	high	low	high	med	med	med	med	med	med	med	med
3	w/o project	high	high	high	low	high	high	med	med	med	med	med	med	med	med
4	w/o project	high	high	high	low	low	high	med	med	med	med	med	med	med	med
5	w/o project	high	high	high	high	high	low	med	med	med	med	med	med	med	med
6	w/o project	high	high	high	high	low	low	med	med	med	med	med	med	med	med
7	w/o project	high	high	high	low	high	low	med	med	med	med	med	med	med	med
8	w/o project	high	high	high	low	low	low	med	med	med	med	med	med	med	med
9	w/o project	high	high	low	high	high	high	med	med	med	med	med	med	med	med
10	w/o project	high	high	low	high	low	high	med	med	med	med	med	med	med	med
11	w/o project	high	high	low	low	high	high	med	med	med	med	med	med	med	med
12	w/o project	high	high	low	low	low	high	med	med	med	med	med	med	med	med
13	w/o project	high	high	low	high	high	low	med	med	med	med	med	med	med	med
14	w/o project	high	high	low	high	low	low	med	med	med	med	med	med	med	med
15	w/o project	high	high	low	low	high	low	med	med	med	med	med	med	med	med
16	w/o project	high	high	low	low	low	low	med	med	med	med	med	med	med	med
17	w/o project	med	med	high	high	high	high	med	med	med	med	med	med	med	med
18	w/o project	med	med	high	high	low	high	med	med	med	med	med	med	med	med
19	w/o project	med	med	high	low	high	high	med	med	med	med	med	med	med	med
20	w/o project	med	med	high	low	low	high	med	med	med	med	med	med	med	med
21	w/o project	med	med	high	high	high	low	med	med	med	med	med	med	med	med
22	w/o project	med	med	high	high	low	low	med	med	med	med	med	med	med	med

Run ID	Mesh	Net Recharge	Head BC	Pumping	Subsurface Material										
					L2-1	L3A	L3B-2	L1	L2-2	L3B-1	L4	L5	L6	L7-1	L7-2
23	w/o project	med	med	high	low	high	low	med	med	med	med	med	med	med	med
24	w/o project	med	med	high	low	low	low	med	med	med	med	med	med	med	med
25	w/o project	med	med	low	high	high	high	med	med	med	med	med	med	med	med
26	w/o project	med	med	low	high	low	high	med	med	med	med	med	med	med	med
27	w/o project	med	med	low	low	high	high	med	med	med	med	med	med	med	med
28	w/o project	med	med	low	low	low	high	med	med	med	med	med	med	med	med
29	w/o project	med	med	low	high	high	low	med	med	med	med	med	med	med	med
30	w/o project	med	med	low	high	low	low	med	med	med	med	med	med	med	med
31	w/o project	med	med	low	low	high	low	med	med	med	med	med	med	med	med
32	w/o project	med	med	low	low	low	low	med	med	med	med	med	med	med	med
33	w/o project	low	low	high	high	high	high	med	med	med	med	med	med	med	med
34	w/o project	low	low	high	high	low	high	med	med	med	med	med	med	med	med
35	w/o project	low	low	high	low	high	high	med	med	med	med	med	med	med	med
36	w/o project	low	low	high	low	low	high	med	med	med	med	med	med	med	med
37	w/o project	low	low	high	high	high	low	med	med	med	med	med	med	med	med
38	w/o project	low	low	high	high	low	low	med	med	med	med	med	med	med	med
39	w/o project	low	low	high	low	high	low	med	med	med	med	med	med	med	med
40	w/o project	low	low	high	low	low	low	med	med	med	med	med	med	med	med
41	w/o project	low	low	low	high	high	high	med	med	med	med	med	med	med	med
42	w/o project	low	low	low	high	low	high	med	med	med	med	med	med	med	med
43	w/o project	low	low	low	low	high	high	med	med	med	med	med	med	med	med
44	w/o project	low	low	low	low	low	high	med	med	med	med	med	med	med	med
45	w/o project	low	low	low	high	high	low	med	med	med	med	med	med	med	med

Run ID	Mesh	Net Recharge	Head BC	Pumping	Subsurface Material										
					L2-1	L3A	L3B-2	L1	L2-2	L3B-1	L4	L5	L6	L7-1	L7-2
46	w/o project	low	low	low	high	low	low	med	med	med	med	med	med	med	med
47	w/o project	low	low	low	low	high	low	med	med	med	med	med	med	med	med
48	w/o project	low	low	low	low	low	low	med	med	med	med	med	med	med	med
49	w/ project	high	high	high	high	high	high	med	med	med	med	med	med	med	med
50	w/ project	high	high	high	high	low	high	med	med	med	med	med	med	med	med
51	w/ project	high	high	high	low	high	high	med	med	med	med	med	med	med	med
52	w/ project	high	high	high	low	low	high	med	med	med	med	med	med	med	med
53	w/ project	high	high	high	high	high	low	med	med	med	med	med	med	med	med
54	w/ project	high	high	high	high	low	low	med	med	med	med	med	med	med	med
55	w/ project	high	high	high	low	high	low	med	med	med	med	med	med	med	med
56	w/ project	high	high	high	low	low	low	med	med	med	med	med	med	med	med
57	w/ project	high	high	low	high	high	high	med	med	med	med	med	med	med	med
58	w/ project	high	high	low	high	low	high	med	med	med	med	med	med	med	med
59	w/ project	high	high	low	low	high	high	med	med	med	med	med	med	med	med
60	w/ project	high	high	low	low	low	high	med	med	med	med	med	med	med	med
61	w/ project	high	high	low	high	high	low	med	med	med	med	med	med	med	med
62	w/ project	high	high	low	high	low	low	med	med	med	med	med	med	med	med
63	w/ project	high	high	low	low	high	low	med	med	med	med	med	med	med	med
64	w/ project	high	high	low	low	low	low	med	med	med	med	med	med	med	med
65	w/ project	med	med	high	high	high	high	med	med	med	med	med	med	med	med
66	w/ project	med	med	high	high	low	high	med	med	med	med	med	med	med	med
67	w/ project	med	med	high	low	high	high	med	med	med	med	med	med	med	med
68	w/ project	med	med	high	low	low	high	med	med	med	med	med	med	med	med

Run ID	Mesh	Net Recharge	Head BC	Pumping	Subsurface Material										
					L2-1	L3A	L3B-2	L1	L2-2	L3B-1	L4	L5	L6	L7-1	L7-2
69	w/ project	med	med	high	high	high	low	med	med	med	med	med	med	med	med
70	w/ project	med	med	high	high	low	low	med	med	med	med	med	med	med	med
71	w/ project	med	med	high	low	high	low	med	med	med	med	med	med	med	med
72	w/ project	med	med	high	low	low	low	med	med	med	med	med	med	med	med
73	w/ project	med	med	low	high	high	high	med	med	med	med	med	med	med	med
74	w/ project	med	med	low	high	low	high	med	med	med	med	med	med	med	med
75	w/ project	med	med	low	low	high	high	med	med	med	med	med	med	med	med
76	w/ project	med	med	low	low	low	high	med	med	med	med	med	med	med	med
77	w/ project	med	med	low	high	high	low	med	med	med	med	med	med	med	med
78	w/ project	med	med	low	high	low	low	med	med	med	med	med	med	med	med
79	w/ project	med	med	low	low	high	low	med	med	med	med	med	med	med	med
80	w/ project	med	med	low	low	low	low	med	med	med	med	med	med	med	med
81	w/ project	low	low	high	high	high	high	med	med	med	med	med	med	med	med
82	w/ project	low	low	high	high	low	high	med	med	med	med	med	med	med	med
83	w/ project	low	low	high	low	high	high	med	med	med	med	med	med	med	med
84	w/ project	low	low	high	low	low	high	med	med	med	med	med	med	med	med
85	w/ project	low	low	high	high	high	low	med	med	med	med	med	med	med	med
86	w/ project	low	low	high	high	low	low	med	med	med	med	med	med	med	med
87	w/ project	low	low	high	low	high	low	med	med	med	med	med	med	med	med
88	w/ project	low	low	high	low	low	low	med	med	med	med	med	med	med	med
89	w/ project	low	low	low	high	high	high	med	med	med	med	med	med	med	med
90	w/ project	low	low	low	high	low	high	med	med	med	med	med	med	med	med
91	w/ project	low	low	low	low	high	high	med	med	med	med	med	med	med	med

Run ID	Mesh	Net Recharge	Head BC	Pumping	Subsurface Material										
					L2-1	L3A	L3B-2	L1	L2-2	L3B-1	L4	L5	L6	L7-1	L7-2
92	w/ project	low	low	low	low	low	high	med	med	med	med	med	med	med	med
93	w/ project	low	low	low	high	high	low	med	med	med	med	med	med	med	med
94	w/ project	low	low	low	high	low	low	med	med	med	med	med	med	med	med
95	w/ project	low	low	low	low	high	low	med	med	med	med	med	med	med	med
96	w/ project	low	low	low	low	low	low	med	med	med	med	med	med	med	med

* high = high value; med = medium value; low = low value

The low, medium, and high values of hydraulic conductivity for Material L1 are (0.5, 0.5, 0.5), (2.8, 2.8, 2.8), and (5, 5, 5) ft/d

The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d

The low, medium, and high values of hydraulic conductivity for Material L2-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/d

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d

The low, medium, and high values of hydraulic conductivity for Material L3B-1 are (0.5, 0.5, 0.4), (1, 1, 0.8), and (5, 5, 4) ft/d

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/d

The low, medium, and high values of hydraulic conductivity for Material L4 are (5, 5, 0.5), (10, 10, 1), and (30, 30, 3) ft/d

The low, medium, and high values of hydraulic conductivity for Material L5 are (150, 150, 12), (400, 400, 32), and (750, 750, 60) ft/d

The low, medium, and high values of hydraulic conductivity for Material L6 are (10, 10, 5), (35, 35, 17.5), and (35, 35, 17.5) ft/d

The low, medium, and high values of hydraulic conductivity for Material L7-1 are (200, 200, 20), (500, 500, 50), and (1375, 1375, 137.5) ft/d

The low, medium, and high values of hydraulic conductivity for Material L7-2 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d

$$DRate_i = \left(\frac{\partial f}{\partial x_i}\right) \Big/ \left(f_{ref} / x_{i,ref}\right) \tag{6}$$

where:

$DRate_i$ = the dimensionless system response change rate with respect to factor x_i;

f_{ref} = the system response when the factors are set to desired reference values $x_{i,ref}$.

Although Equation 6 has been broadly used in many areas, the applicable range issue mentioned above still exists.

In this HHD Phase 1A modeling, the system response is groundwater flows through the 21 specified cross sections. Factors that are considered in sensitivity analysis are the hydraulic conductivities of the 11 hydrogeologic units, where some units are permeable, e.g., Materials L3A, L5, and L7-1, and some are fairly impermeable, e.g., Materials L2-1 and L7-2. To handle the applicable range issue, the following two quantities were considered for sensitivity analysis:

$$F_{diff,i} = F(K_{1,med},..,K_{i,ext},...) - F(K_{1,med},..,K_{i,med},...) \tag{7}$$

$$Unit\ F_{diff,i} = \frac{F_{diff,i}}{L} \tag{8}$$

where:

$F_{diff,i}$ = the difference of cross-sectional flow between the based case when all hydraulic conductivities are assigned with the medium values (i.e., $K_{1,med}$, ...), and the case with the i-th conductivity set to either the high or the low value (i.e., $K_{i,ext}$) [L^3/t];

F = the cross-sectional flow at desired conductivity values [L^3/t];

$Unit\ F_{diff,I}$ = the associated unit difference that is defined as the flow difference (i.e., $F_{diff,i}$) divided by the corresponding HHD reach length (i.e., L) [L^3/t/L].

With Equations 7 and 8 employed for sensitivity analysis in the manner described above, the applicable range issue associated with hydraulic conductivity due to uncertainty and other constraints in experiments is addressed.

As shown in Appendix B of the HHD Conceptual Model Report (dated June 2007), if we pick among the 11 hydraulic conductivities the two, three, and four most influential ones based on the Stage 1 result analysis, the associated numbers of model runs in Stage 2 analysis will be 48, 96, and 192, respectively. Based on the given duration of the project, i.e., February-September, 2007, and time needed for model set-up, running, and result analysis, three was the number proposed in the conceptual model report. More time will be needed to complete this HHD Phase 1A model if based on the Stage 1 result analysis there exist four conductivities to be considered in Stage 2 analysis. Fortunately, the analysis of Stage 1 results suggests that Materials L2-1, L3A, and L3B-2 are significantly more influential than the others on the flow through the 21 specified cross-sections. Therefore, 96 model runs are included in Stage 2 analysis.

Stage 1 analysis

In the sensitivity analysis considered in this stage, the groundwater flow rates through the 21 specified cross sections were compared between the base case run and the other model runs for both the “without project” and the “with project” scenarios. The computed flow rates through the 21 cross sections are given in Appendix C. Tables and Figures of Stage 1 Results of HHD Phase 1A model (Tables C1 through C44). Tables C1 through C22 list computed cross-sectional flow rate results for the comparison of the “without project” scenario, while Tables C23 through C44 are for the comparison of the “with project” scenario. Each of Tables C1 through C44 provides information of (1) cross section ID, (2) cross section description, (3) cross-sectional flow rate of the base case, (4) cross-sectional flow rate of the specified case, (5) flow rate difference between the base case and the specified case, (6) unit flow rate difference between the base case and the specified case, which is equal to the flow rate difference divided by the corresponding HHD reach length, (7) average absolute flow rate difference and unit difference for each reach, and (8) overall average absolute flow rate difference and unit difference. The cross-sectional flow rate was defined to be positive if the net groundwater flow through the cross section moved in the direction away from Lake Okeechobee.

For example, in Table C1 the averaged absolute flow rate difference for Reach 1 is the sum of the absolute values of the first seven numbers in the column of “Run2-Run1” divided by 7. Likewise, the overall averaged absolute flow rate difference is the sum of the absolute values of the 21 numbers in the column of “Run2-Run1” divided by 21.

To determine which three hydraulic conductivities had the greatest impacts on the groundwater flow rates of the 21 specified cross sections, the averaged absolute flow rate difference values were extracted from Tables C1 through C44 and summarized in Tables 13 and 14 for sensitivity analysis of “without project” and “with project”, respectively. In both tables, the first column identifies the comparisons made; the second column identifies the subsurface material whose hydraulic conductivity was tested in each corresponding comparison; the third and fourth columns present the averaged absolute flow rate difference in cfd and unit difference in cft/ft, respectively for Reach 1, the fifth and sixth for Reach 2, the seventh and eighth for Reach 3, and last two for overall. For each of Columns 3 through 10, the six largest values were shaded in colors in both tables. It is obvious that the hydraulic conductivities of Materials L2-1, L3A, and L3B-2 had larger effects on cross-sectional flow rate than the other materials. Therefore, the hydraulic conductivities of Materials L2-1, L3A, and L3B-2 were determined to be the three most influential hydraulic conductivities, and they were taken into account in Stage 2 analysis, where only the medium values were used for the hydraulic conductivities of the other eight materials.

The comparison of cross-sectional flows between “with project” and “without project” runs for the 23 pairs considered in Stage 1 are also included in the tables in Appendix C (Tables C45 through C67). In each of these tables, the computed cross-sectional flow rates of the 21 specified cross-sections are provided for both the “without project” and “with project” runs. Based on these values, the difference and the unit difference of flow rate (see definition given in the tables) for each cross section were computed. These tables also provide the average values of cross-sectional flow, flow difference, unit flow difference for the seven cross-sections in each reach (highlighted in blue) and for all cross-sections (highlighted in red). It is noted that the average values of flow difference and unit difference were calculated based on the average flow rates computed for the “without project” and the “with project” runs, rather than from the values of each individual cross-section. Table 15 lists all overall average

Table 13. Average cross-sectional flow differences for the "without project" scenario in Stage 1 sensitivity analysis.

Without Project									
Comparison	Tested K*	Reach 1 Avg. Abs. Diff.		Reach 2 Avg. Abs. Diff.		Reach 3 Avg. Abs. Diff.		Overall Avg. Abs. Diff.	
		cfd	cfd/ft**	cfd	cfd/ft	cfd	cfd/ft	cfd	cfd/ft
Run2 - Run1	L1	1284	0.0037	726	0.0067	1195	0.0345	1068	0.0022
Run3 - Run1	L1	4134	0.0118	3106	0.0287	3865	0.1115	3702	0.0075
Run4 - Run1	L2-1	21549	0.0616	12575	0.1161	9126	0.2632	14417	0.0293
Run5 - Run1	L2-1	27517	0.0787	14615	0.1349	10449	0.3013	17527	0.0356
Run6 - Run1	L2-2	1394	0.0040	7666	0.0708	798	0.0230	3286	0.0067
Run7 - Run1	L2-2	2647	0.0076	2045	0.0189	1616	0.0466	2103	0.0043
Run8 - Run1	L3A	54647	0.1562	39148	0.3613	27955	0.8062	40583	0.0823
Run9 - Run1	L3A	109108	0.3119	74046	0.6835	46124	1.3302	76426	0.1551
Run10 - Run1	L3B-1	711	0.0020	950	0.0088	0	0.0000	554	0.0011
Run11 - Run1	L3B-1	281	0.0008	346	0.0032	0	0.0000	209	0.0004
Run12 - Run1	L3B-2	21588	0.0617	715	0.0066	9767	0.2817	10690	0.0217
Run13 - Run1	L3B-2	2187	0.0063	648	0.0060	1770	0.0510	1535	0.0031
Run14 - Run1	L4	3957	0.0113	2491	0.0230	2904	0.0837	3117	0.0063
Run15 - Run1	L4	1171	0.0033	1094	0.0101	1159	0.0334	1141	0.0023
Run16 - Run1	L5	7845	0.0224	2360	0.0218	6627	0.1911	5610	0.0114
Run17 - Run1	L5	9768	0.0279	5909	0.0545	5278	0.1522	6985	0.0142
Run18 - Run1	L6	0	0.0000	0	0.0000	0	0.0000	0	0.0000
Run19 - Run1	L6	690	0.0020	898	0.0083	1203	0.0347	930	0.0019
Run20 - Run1	L7-1	456	0.0013	1017	0.0094	0	0.0000	491	0.0010
Run21 - Run1	L7-1	690	0.0020	1463	0.0135	0	0.0000	718	0.0015
Run22 - Run1	L7-2	142	0.0004	116	0.0011	43	0.0012	100	0.0002
Run23 - Run1	L7-2	41	0.0001	35	0.0003	12	0.0004	29	0.0001

cfd = cubic feet per day.

* The low, medium, and high values of hydraulic conductivity for Material L1 are (0.5, 0.5, 0.5), (2.8, 2.8, 2.8), and (5, 5, 5) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L2-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3B-1 are (0.5, 0.5, 0.4), (1, 1, 0.8), and (5, 5, 4) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L4 are (5, 5, 0.5), (10, 10, 1), and (30, 30, 3) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L5 are (150, 150, 12), (400, 400, 32), and (750, 750, 60) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L6 are (10, 10, 5), (35, 35, 17.5), and (35, 35, 17.5) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L7-1 are (200, 200, 20), (500, 500, 50), and (1375, 1375, 137.5) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L7-2 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d.

** This column presents unit flow rate difference which is equal to flow rate difference divided by the corresponding reach length: 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table 14. Average cross-sectional flow differences for the "with project" scenario in Stage 1 sensitivity analysis.

With Project									
Comparison	Tested K*	Reach 1 Avg. Abs. Diff.		Reach 2 Avg. Abs. Diff.		Reach 3 Avg. Abs. Diff.		Overall Avg. Abs. Diff.	
		cfd	cfd/ft**	cfd	cfd/ft	cfd	cfd/ft	cfd	cfd/ft
Run25 - Run24	L1	776	0.0022	721	0.0067	817	0.0236	771	0.0016
Run26 - Run24	L1	2895	0.0083	2757	0.0254	2490	0.0718	2714	0.0055
Run27 - Run24	L2-1	11344	0.0324	2848	0.0263	5451	0.1572	6548	0.0133
Run28 - Run24	L2-1	18904	0.0540	4989	0.0461	6947	0.2004	10280	0.0209
Run29 - Run24	L2-2	1041	0.0030	6014	0.0555	541	0.0156	2532	0.0051
Run30 - Run24	L2-2	1360	0.0039	1222	0.0113	1031	0.0297	1204	0.0024
Run31 - Run24	L3A	32194	0.0920	15223	0.1405	18631	0.5373	22016	0.0447
Run32 - Run24	L3A	70782	0.2023	33579	0.3099	33249	0.9589	45870	0.0931
Run33 - Run24	L3B-1	7981	0.0228	8602	0.0794	0	0.0000	5528	0.0112
Run34 - Run24	L3B-1	2389	0.0068	3317	0.0306	46	0.0013	1917	0.0039
Run35 - Run24	L3B-2	37175	0.1063	10025	0.0925	18314	0.5282	21838	0.0443
Run36 - Run24	L3B-2	31431	0.0899	12173	0.1124	15454	0.4457	19686	0.0399
Run37 - Run24	L4	8393	0.0240	3143	0.0290	4734	0.1365	5424	0.0110
Run38 - Run24	L4	2759	0.0079	1948	0.0180	2307	0.0665	2338	0.0047
Run39 - Run24	L5	2644	0.0076	2474	0.0228	6572	0.1895	3897	0.0079
Run40 - Run24	L5	2691	0.0077	1655	0.0153	5701	0.1644	3349	0.0068
Run41 - Run24	L6	0	0.0000	0	0.0000	0	0.0000	0	0.0000
Run42 - Run24	L6	631	0.0018	922	0.0085	1459	0.0421	1004	0.0020
Run43 - Run24	L7-1	254	0.0007	879	0.0081	0	0.0000	378	0.0008
Run44 - Run24	L7-1	468	0.0013	1345	0.0124	47	0.0013	620	0.0013

With Project									
Comparison	Tested K*	Reach 1 Avg. Abs. Diff.		Reach 2 Avg. Abs. Diff.		Reach 3 Avg. Abs. Diff.		Overall Avg. Abs. Diff.	
		cfd	cfd/ft**	cfd	cfd/ft	cfd	cfd/ft	cfd	cfd/ft
Run45 - Run24	L7-2	173	0.0005	131	0.0012	45	0.0013	116	0.0002
Run46 - Run24	L7-2	180	0.0005	79	0.0007	58	0.0236	106	0.0002

cfd = cubic feet per day.

* The low, medium, and high values of hydraulic conductivity for Material L1 are (0.5, 0.5, 0.5), (2.8, 2.8, 2.8), and (5, 5, 5) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L2-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3B-1 are (0.5, 0.5, 0.4), (1, 1, 0.8), and (5, 5, 4) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L4 are (5, 5, 0.5), (10, 10, 1), and (30, 30, 3) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L5 are (150, 150, 12), (400, 400, 32), and (750, 750, 60) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L6 are (10, 10, 5), (35, 35, 17.5), and (35, 35, 17.5) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L7-1 are (200, 200, 20), (500, 500, 50), and (1375, 1375, 137.5) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L7-2 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d.

** This column presents unit flow rate difference which is equal to flow rate difference divided by the corresponding reach length: 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table 15. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 1 sensitivity analysis: overall average on difference and unit difference.

	Low K		Medium K (i.e., Base Case)		High K	
	Difference, cfd	Unit Difference, cfd/ft	Difference, cfd	Unit Difference, cfd/ft	Difference, cfd	Unit Difference, cfd/ft
Tested K*	(w/ - w/o)	(w/ - w/o)/L**	(w/ - w/o)/L	w/ - w/o)/L	(w/ - w/o)	(w/ - w/o)/L
L1	-41300	-0.2499	-42828	-0.2587	-43589	-0.2631
L2-1	-35280	-0.2135	-42828	-0.2587	-51067	-0.3077
L2-2	-42847	-0.2590	-42828	-0.2587	-43558	-0.2631
L3A	-11988	-0.0723	-42828	-0.2587	-61417	-0.3713
L3B-1	-44242	-0.2673	-42828	-0.2587	-37908	-0.2287
L3B-2	-61360	-0.3710	-42828	-0.2587	-31375	-0.1896
L4	-43603	-0.2636	-42828	-0.2587	-41040	-0.2475
L5	-38532	-0.2324	-42828	-0.2587	-46072	-0.2786
L6	-43358	-0.2762	-42828	-0.2587	-43153	-0.2748
L7-1	-42866	-0.2589	-42828	-0.2587	-42642	-0.2575
L7-2	-42691	-0.2579	-42828	-0.2587	-42782	-0.2584

cfd = cubic feet per day.

* The low, medium, and high values of hydraulic conductivity for Material L1 are (0.5, 0.5, 0.5), (2.8, 2.8, 2.8), and (5, 5, 5) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L2-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3B-1 are (0.5, 0.5, 0.4), (1, 1, 0.8), and (5, 5, 4) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L4 are (5, 5, 0.5), (10, 10, 1), and (30, 30, 3) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L5 are (150, 150, 12), (400, 400, 32), and (750, 750, 60) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L6 are (10, 10, 5), (35, 35, 17.5), and (35, 35, 17.5) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L7-1 are (200, 200, 20), (500, 500, 50), and (1375, 1375, 137.5) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L7-2 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d.

** This column presents unit flow rate difference which is equal to flow rate difference divided by the corresponding reach length (L), where the reach length is 492,822 ft for combined reaches 1, 2, and 3.

values of both flow difference and unit difference from Tables C45 through C67. Table 15 was arranged in a way that both flow difference and unit difference values can be easily compared among the runs when the low, the medium, and the high conductivity values of each of the eleven subsurface materials were considered. It is seen from this table that Materials L2-1, L3A, and L3B-2 generated greater changes of the overall average flow difference and unit difference values from low K to high K

than the other subsurface materials (shaded rows) did, indicating that these three materials had more impact than the others did on groundwater flow through the 21 specified cross-sections. This result is consistent with the outcome of the analysis conducted above.

It is also seen from Table 15 that the overall average cross-sectional flow difference increased with the hydraulic conductivity values of Materials L2-1 and L3A, but decreased with the hydraulic conductivity value of Material L3B-2. This is because the existence of the cutoff wall changed the groundwater flow pattern within Materials L2-1, L3A, and L3B-2 in the vicinity of HHD (Figures 45, 61 and 62). As a result, the groundwater flow from the lake side to the land side of HHD within Materials L2-1 and L3A was blocked, and Material L3B-2, among these three materials, became the only material permitting groundwater flow. Therefore, the greater the hydraulic conductivities of Materials L2-1 and L3A are, the more groundwater flow is blocked, which results in greater cross-sectional flow differences. On the other hand, a higher hydraulic conductivity of Material L3B-2 will allow more groundwater flow through this material when the cutoff wall does not exist and subsequently reduce the impact of the cutoff wall.

To help better understand how the cutoff wall would impact the flow pattern, the total head distribution and scaled Darcy velocity were examined on 15 selected cross-sections, as shown in Figure 57. Among the 15 cross-sections, five of them are perpendicular to HHD and are located in the middle of Reaches 1A, 1B, 1D, 3, and 2 (Figure 2). They are named X1A-P, X1B-P, X1D-P, X3-P, and X2-P, respectively. Each of these five cross-section intersects with two other selected cross-sections at 5,000 and 10,000 ft from HHD, which are aligned parallel to HHD. Therefore, there are three cross-sections each in Reaches 1A, 1B, 1D, 3, and 2 for flow pattern examination. The naming scheme “5K” and “10K” are used to identify the cross-sections that are 5,000 and 10,000 ft, respectively, aligned parallel to HHD, as shown in Figure 57.

The comparison of total head distribution and scaled velocity on these 15 cross sections are also included in Appendix C (Figures C1 through C25), five figures for each reach. Similar observations can be found from the analysis of these five sets of cross-sections in Reaches 1A, 1B, 1D, 3, and 2. Among the five figures for each set, the first three figures plot total head distribution on the three cross sections, while the last two figures have a focus on both the total head distribution and flow pattern in the vicinity of

HHD on the cross section perpendicular to HHD. The same arrangement made in Figures C1 through C5 for the analysis of the three cross-sections in Reach 1A, are shown in Figures C6 through C10 for the analysis on the three cross-sections in Reach 1B (i.e., X1B-P, X1B-5K, and X1B-10K), Figures C11 through C15 analysis in Reach 1D, Figures C16 through C20 analysis in Reach 3, and Figures C21 through C25 analysis in Reach 2.

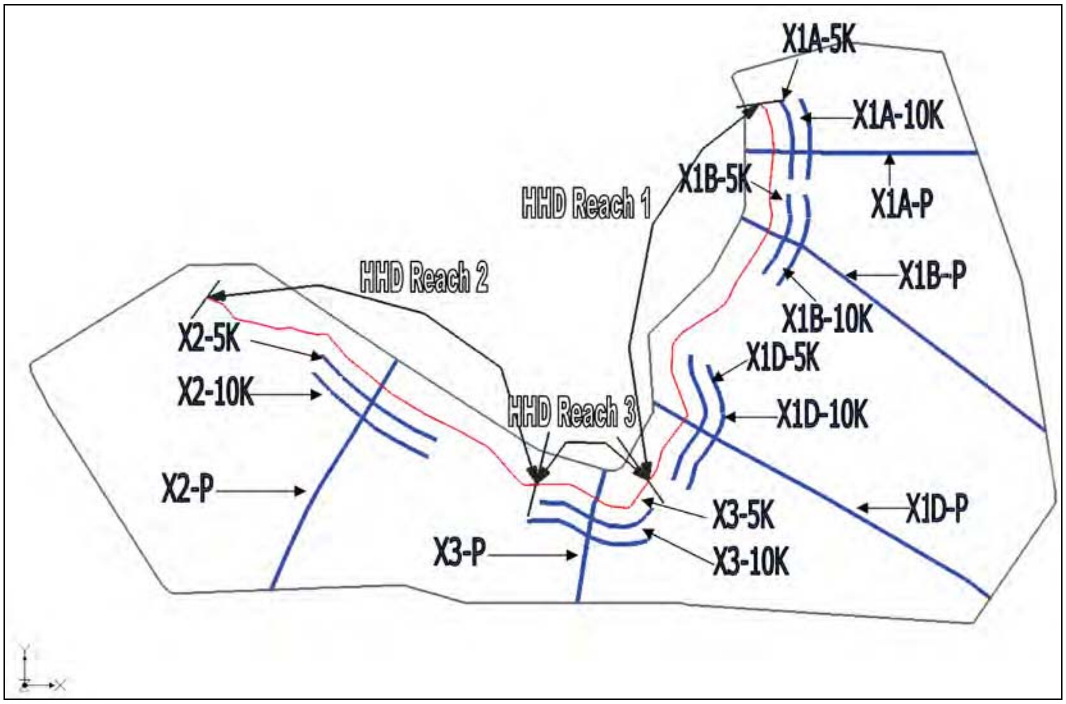

Figure 57. 15 cross-sections used to examine the HHD Phase 1A model computational results.

For the reader's convenience, Figures C1 through C5 are copied to Figures 58 through 62. Figures 58 through 60 compare total head distribution of the Stage 1 base case between “without project” (i.e., No Wall) and “with project” (i.e., With Wall) on X1A-P, X1A-5K, and X1A-10K, while Figures 61 and 62 depict both total head distribution and scaled Darcy velocity in the vicinity of HHD on X1A-P. In these figures, heterogeneous geology is represented with different colors for different subsurface materials, where the color code is provided in each figure. The total head distribution is presented by linear color contour lines and the legend is given on the left of each plot. The scaled Darcy velocity vector is provided as white arrows in each figure; however, it becomes obvious only in the zoom-in figures (i.e., Figures 61 and 62). Although the legend of the scaled velocity magnitude is not given in the figures to avoid confusion caused by crowdedness, the scaled white arrows are sufficient to show both the flow

pattern and relative magnitude of flow velocity. These figures were prepared only for qualitative comparison and better understanding. For precise numerical comparisons of total head and velocity, one can just extract data at desired locations from the solution files of pressure obtained and Darcy velocity.

Figure 58 shows that the total head distributions of the “No Wall” (upper left) and the “With Wall” (lower left) runs look almost identical between Points G and A’, indicating that the cutoff wall impact on total head became minimal beyond Point G. In other words, the cutoff wall had negligible impact beyond Point G. From Figures 59 and 60, it is obvious that the difference of total head distribution between “without project” and “with project” was greater on X1A-5K than that on X1A-10K, implying a decreasing cutoff wall impact with the distance from HHD. This is in agreement with the flow difference (i.e., w/ - w/o) listed in Table 16 (or Table C45 in Appendix C). Figure 61 demonstrates how the existence of the cutoff wall would change the total head distribution in the vicinity of HHD. It can be seen easily in Figure 61 that the total head on the land side of HHD decreased from 13.2 ft in “No Wall” (upper left) to 12.6 ft in “With Wall” (lower left). In other words, the cutoff wall increased the total head differential across HHD by 0.6 ft in this case. The second zoom-in comparison given in Figure 62 shows how the flow pattern changes from “No Wall” to “With Wall”. This figure implicitly suggests Materials L2-1, L3A, and L3B-2 might be more influential than the other subsurface materials on the change of cross-sectional flow from “No Wall” to “With Wall” because the flow pattern within these three layers changed drastically in the vicinity of the HHD.

It is noted the hydro-static (no vertical flow) condition did not exist everywhere based on the total head distribution plots. To highlight this, Figures 63 and 64 depict total head color-fill contours on X2-P, X2-5K, and X2-10K for Stage 1 "without project" and "with project" base case runs, respectively. It is obvious that the hydro-static condition did not exist at the place circled in black on X2-5K though it appears to be valid elsewhere on the three X-sections. A close examination determines that the non-hydro-static situation was caused by the nearby pumping activities. A zoom-in check on the total head distribution in the vicinity of HHD on X2-P reveals that the cutoff wall increased the head differential across HHD and generates a local non-hydro-static condition (Figure 65).

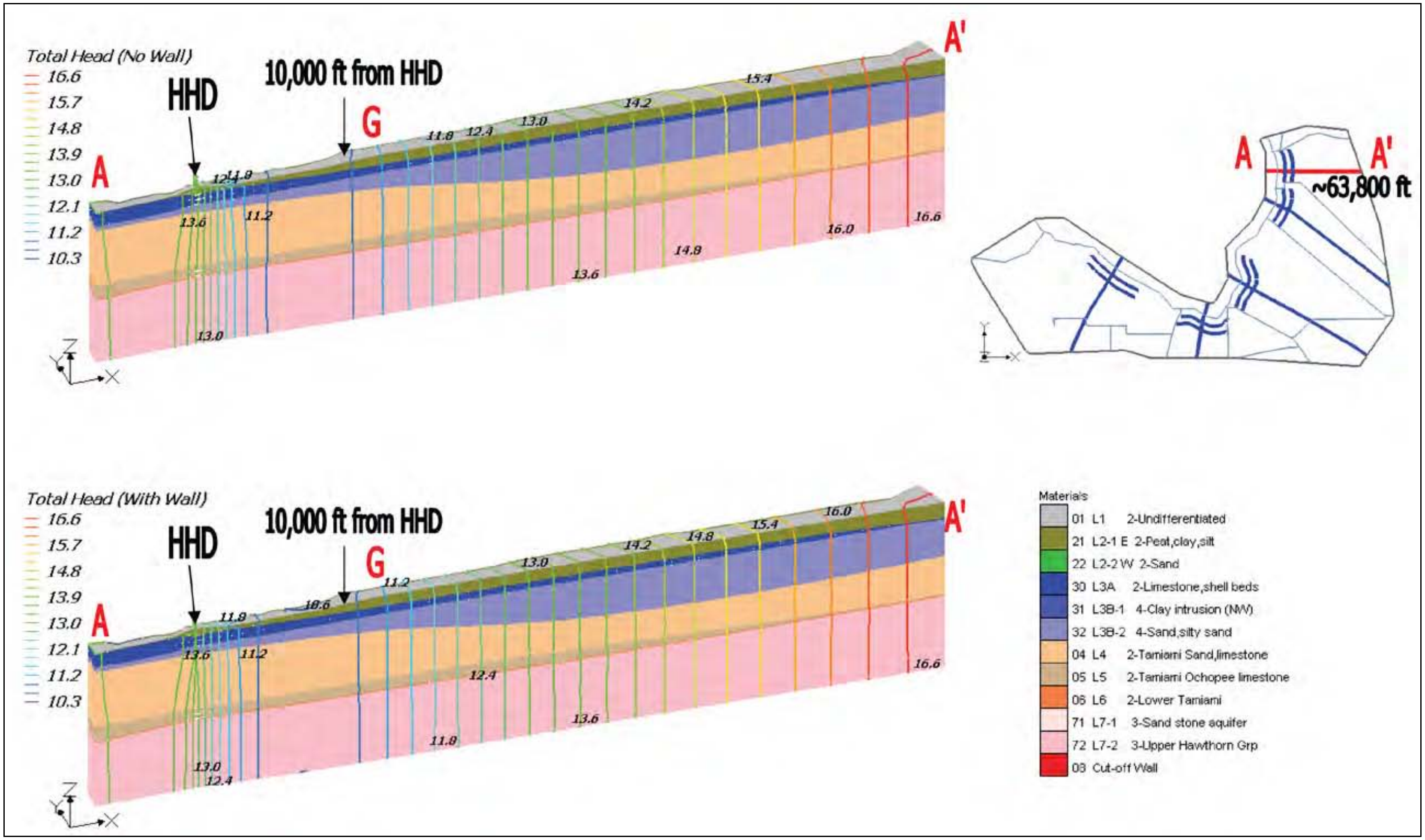

Figure 58. Stage 1 base case total head comparison (linear color contour lines) between "without project" (Run 1, upper left) and "with project" (Run 24, lower left) on Cross Section X1A-P.

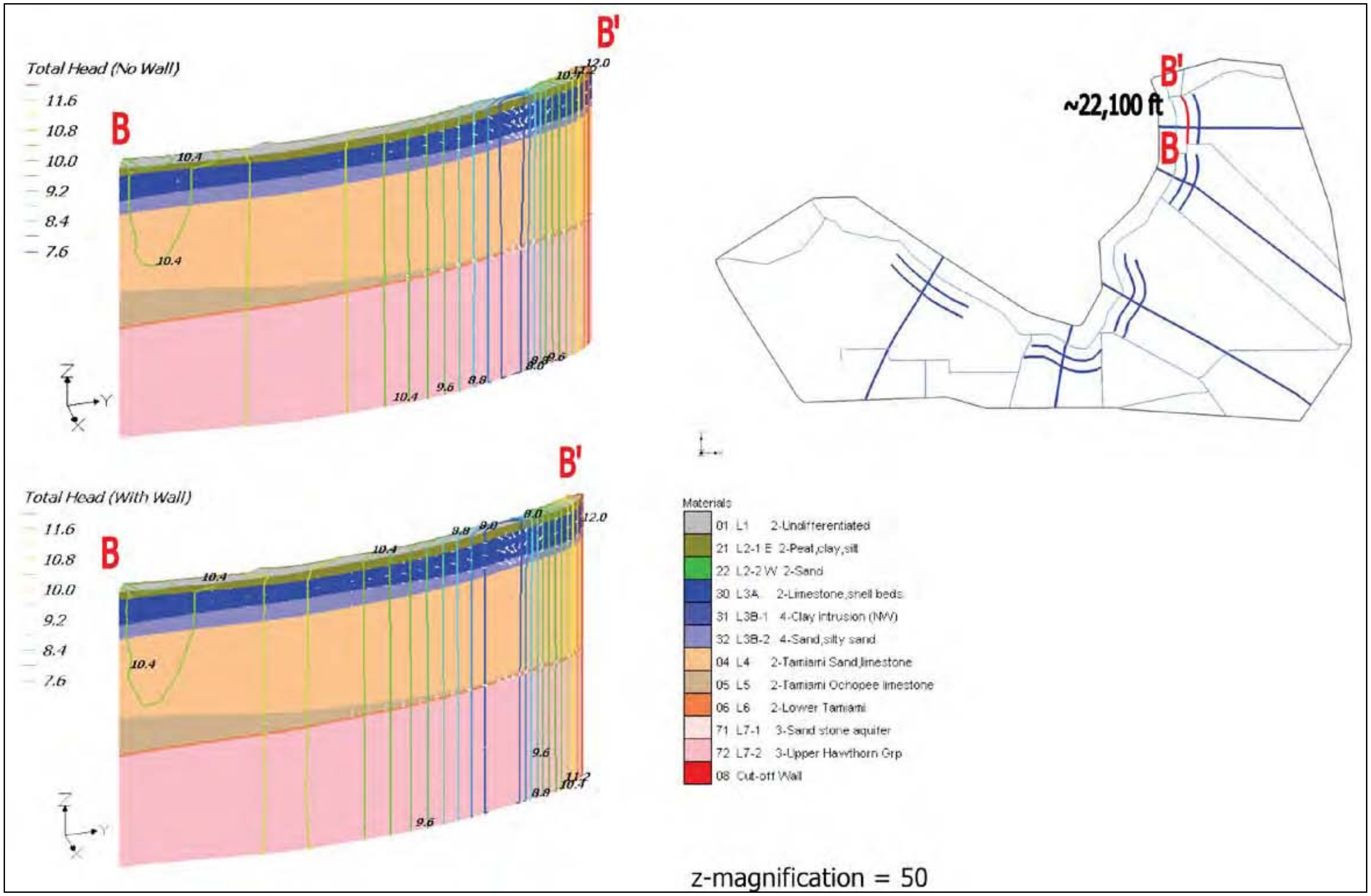

Figure 59. Stage 1 base case total head comparison (linear color contour lines) between "without project" (Run 1, upper left) and "with project" (Run 24, lower left) on Cross Section X1A-5K.

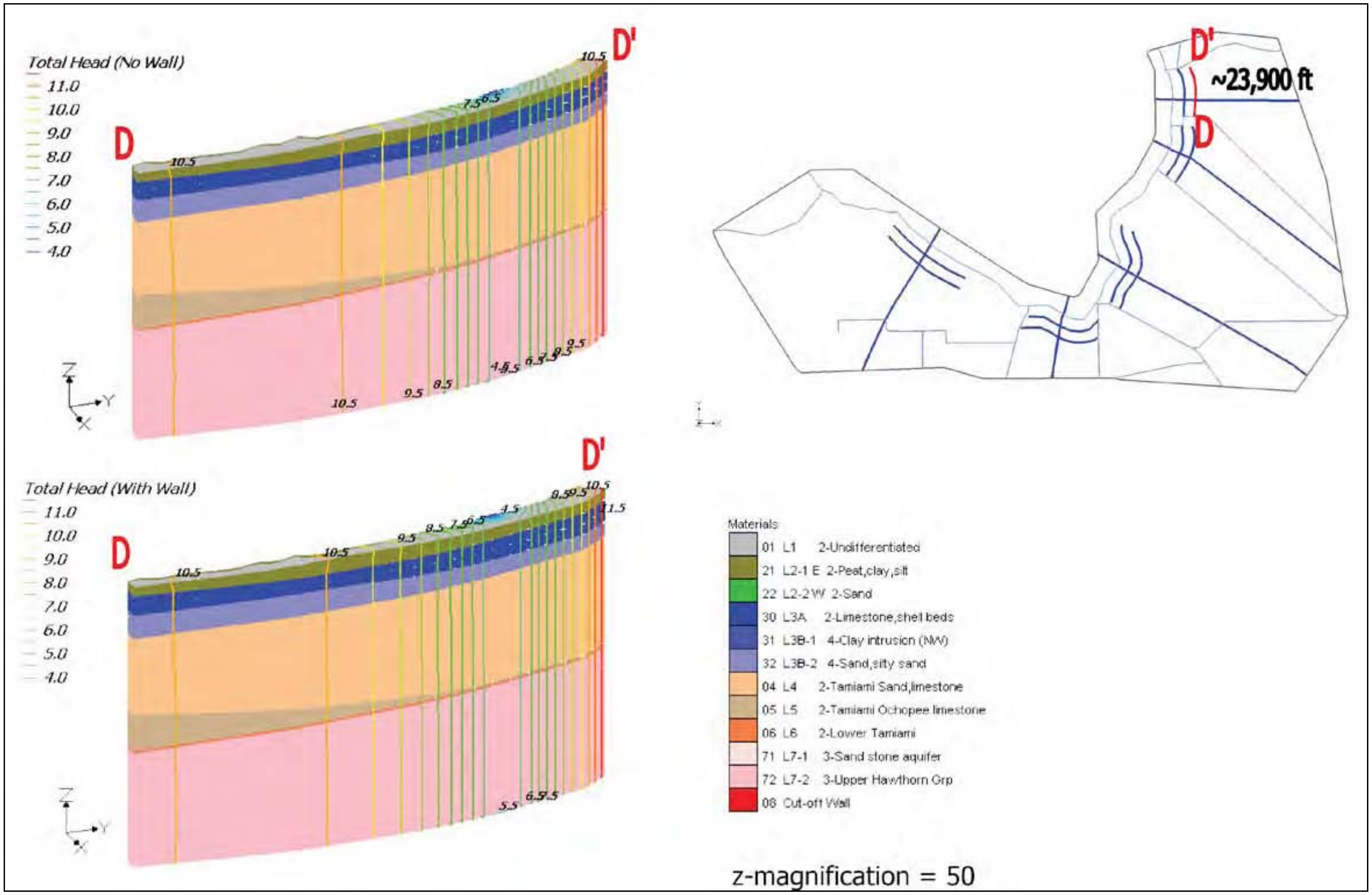

Figure 60. Stage 1 base case total head comparison (linear color contour lines) between "without project" (Run 1, upper left) and "with project" (Run 24, lower left) on Cross Section X1A-10K.

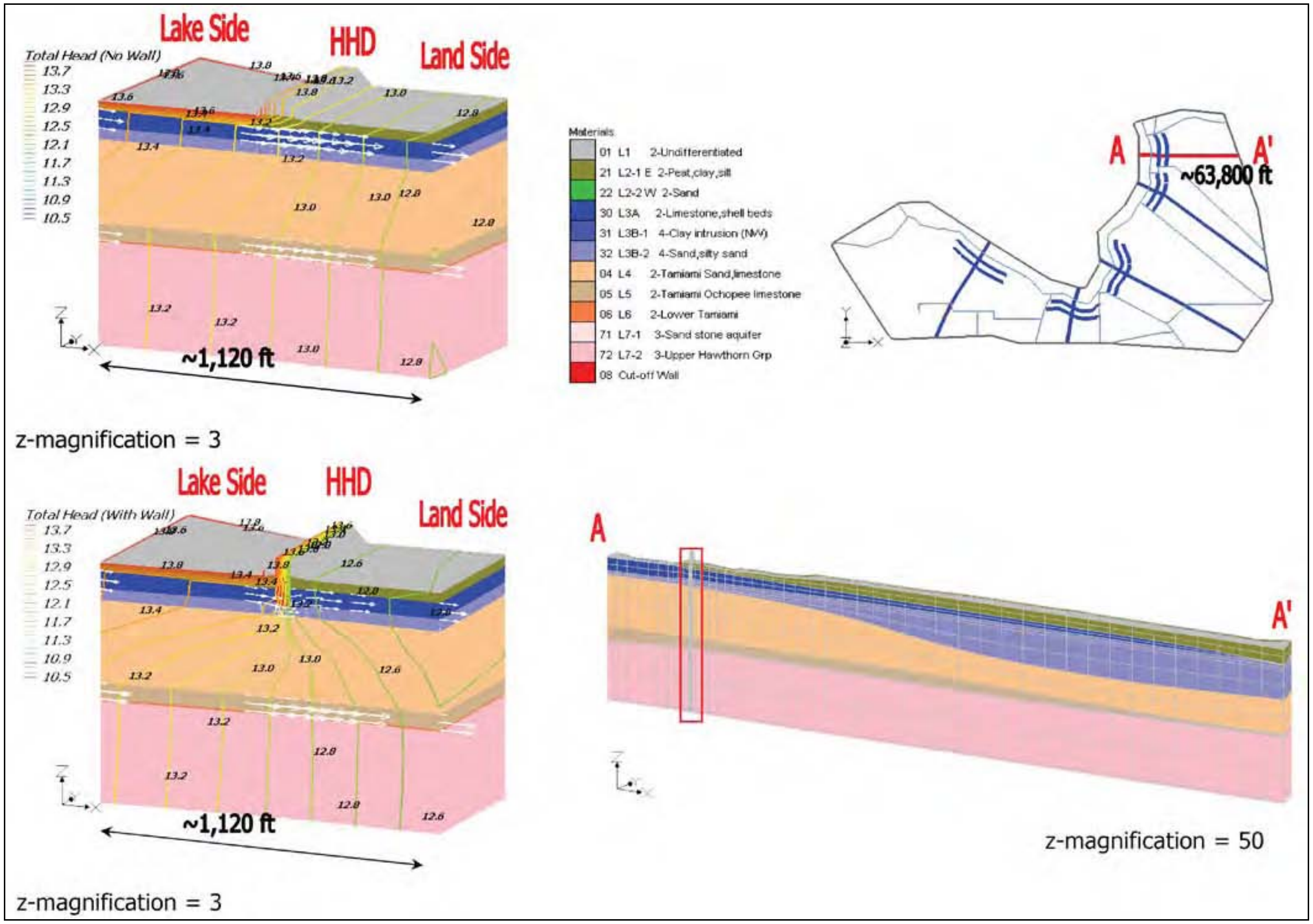

Figure 61. Stage 1 base case zoom-in comparison 1 in the vicinity of HHD between "without project" (Run 1, upper left) and "with project" (Run 24, lower left) on Cross Section X1A-P: total head (linear color contour lines); scaled velocity (light blue arrows).

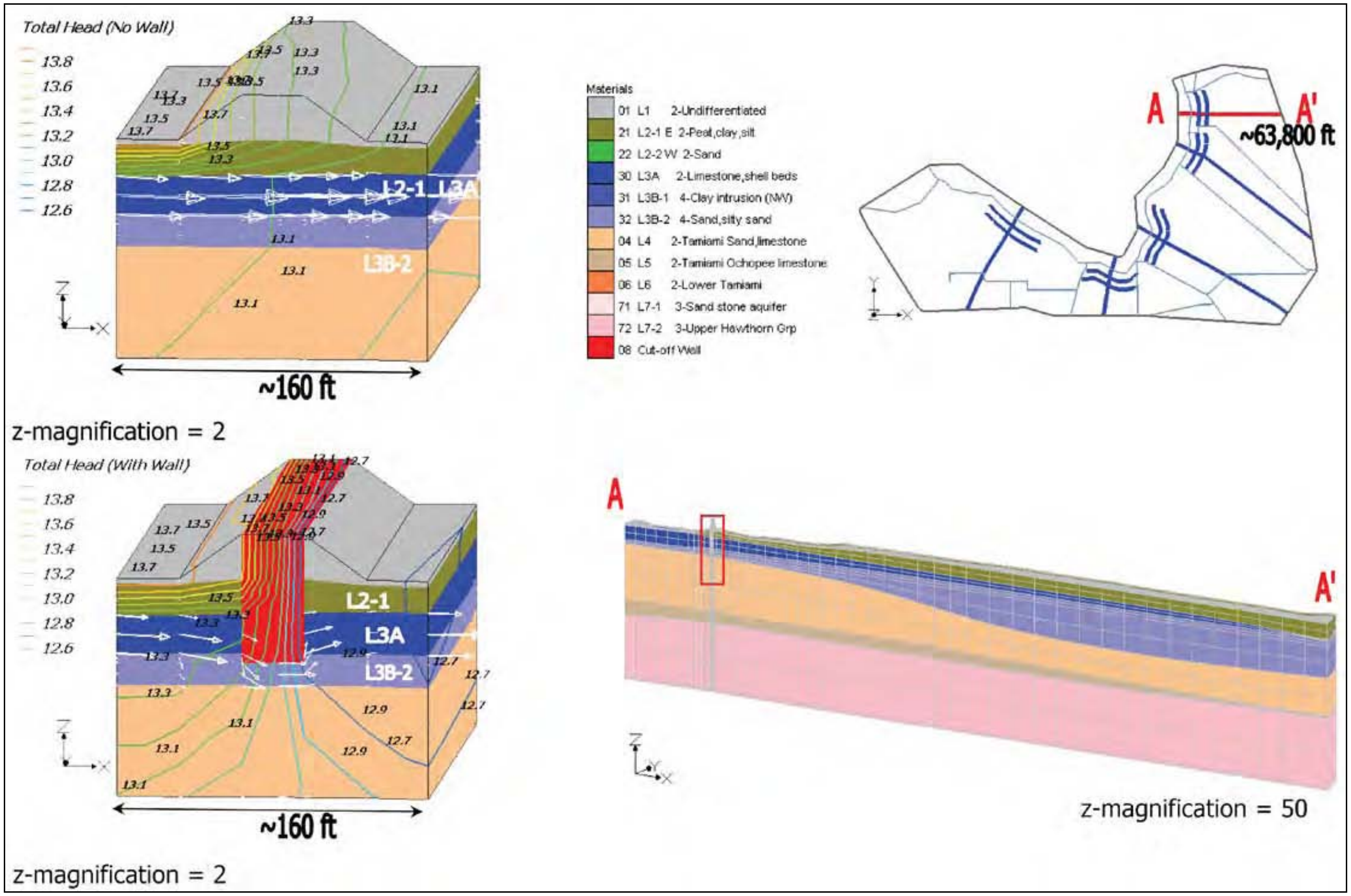

Figure 62. Stage 1 base case zoom-in comparison 2 in the vicinity of HHD between "without project" (Run 1, upper left) and "with project" (Run 24, lower left) on Cross Section X1A-P: total head (linear color contour lines); scaled velocity (light blue arrows).

Table 16. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 1 sensitivity analysis: base case.

X-section ID	Description	Run 1 vs. Run 24, Base Case*		Difference	Unit Difference**
		w/o project, cfd	w/ project, cfd	(w/ - w/o), cfd	(w/ - w/o)/L, cfd/ft
1-1	50 ft from HHD	213585	166922	-46663	-0.1334
1-2	100 ft from HHD	223968	171047	-52921	-0.1513
1-3	200 ft from HHD	248334	181511	-66823	-0.1910
1-4	500 ft from HHD	250633	186569	-64064	-0.1831
1-5	1000 ft from HHD	219396	161810	-57586	-0.1646
1-6	5000 ft from HHD	157455	110489	-46966	-0.1343
1-7	10,000 ft HHD	99567	60656	-38911	-0.1112
Reach 1 average		201848	148429	-53419	-0.1527
2-1	50 ft from HHD	82635	27611	-55024	-0.5079
2-2	100 ft from HHD	106090	39356	-66735	-0.6160
2-3	200 ft from HHD	120366	49866	-70500	-0.6507
2-4	500 ft from HHD	132196	68627	-63570	-0.5868
2-5	1000 ft from HHD	171187	108544	-62643	-0.5782
2-6	5000 ft from HHD	69409	27420	-41989	-0.3876
2-7	10,000 ft HHD	52657	12817	-39840	-0.3677
Reach 2 average		104934	47749	-57186	-0.5278
3-1	50 ft from HHD	35332	2055	-33277	-0.9597
3-2	100 ft from HHD	46351	19359	-26992	-0.7784
3-3	200 ft from HHD	50611	34230	-16381	-0.4724
3-4	500 ft from HHD	79941	67629	-12312	-0.3551
3-5	1000 ft from HHD	109291	98209	-11081	-0.3196
3-6	5000 ft from HHD	76291	68060	-8231	-0.2374
3-7	10,000 ft HHD	81720	71881	-9838	-0.2837
Reach 3 average		68505	51632	-16873	-0.4866
Overall average		124467	81639	-42828	-0.2587

cfd = cubic feet per day.

* The base case uses the medium values of hydraulic conductivity for all 11 materials:

The low, medium, and high values of hydraulic conductivity for Material L1 are (0.5, 0.5, 0.5), (2.8, 2.8, 2.8), and (5, 5, 5) ft/d;

The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d;

The low, medium, and high values of hydraulic conductivity for Material L2-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/d;

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d;

The low, medium, and high values of hydraulic conductivity for Material L3B-1 are (0.5, 0.5, 0.4), (1, 1, 0.8), and (5, 5, 4) ft/d;

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1, (10, 10, 10), and (100, 100, 100) ft/d;

The low, medium, and high values of hydraulic conductivity for Material L4 are (5, 5, 0.5), (10, 10, 1), and (30, 30, 3) ft/d;

The low, medium, and high values of hydraulic conductivity for Material L5 are (150, 150, 12), (400, 400, 32), and (750, 750, 60) ft/d;

The low, medium, and high values of hydraulic conductivity for Material L6 are (10, 10, 5), (35, 35, 17.5), and (35, 35, 17.5) ft/d;

The low, medium, and high values of hydraulic conductivity for Material L7-1 are (200, 200, 20), (500, 500, 50), and (1375, 1375, 137.5) ft/d;

The low, medium, and high values of hydraulic conductivity for Material L7-2 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d.

** Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

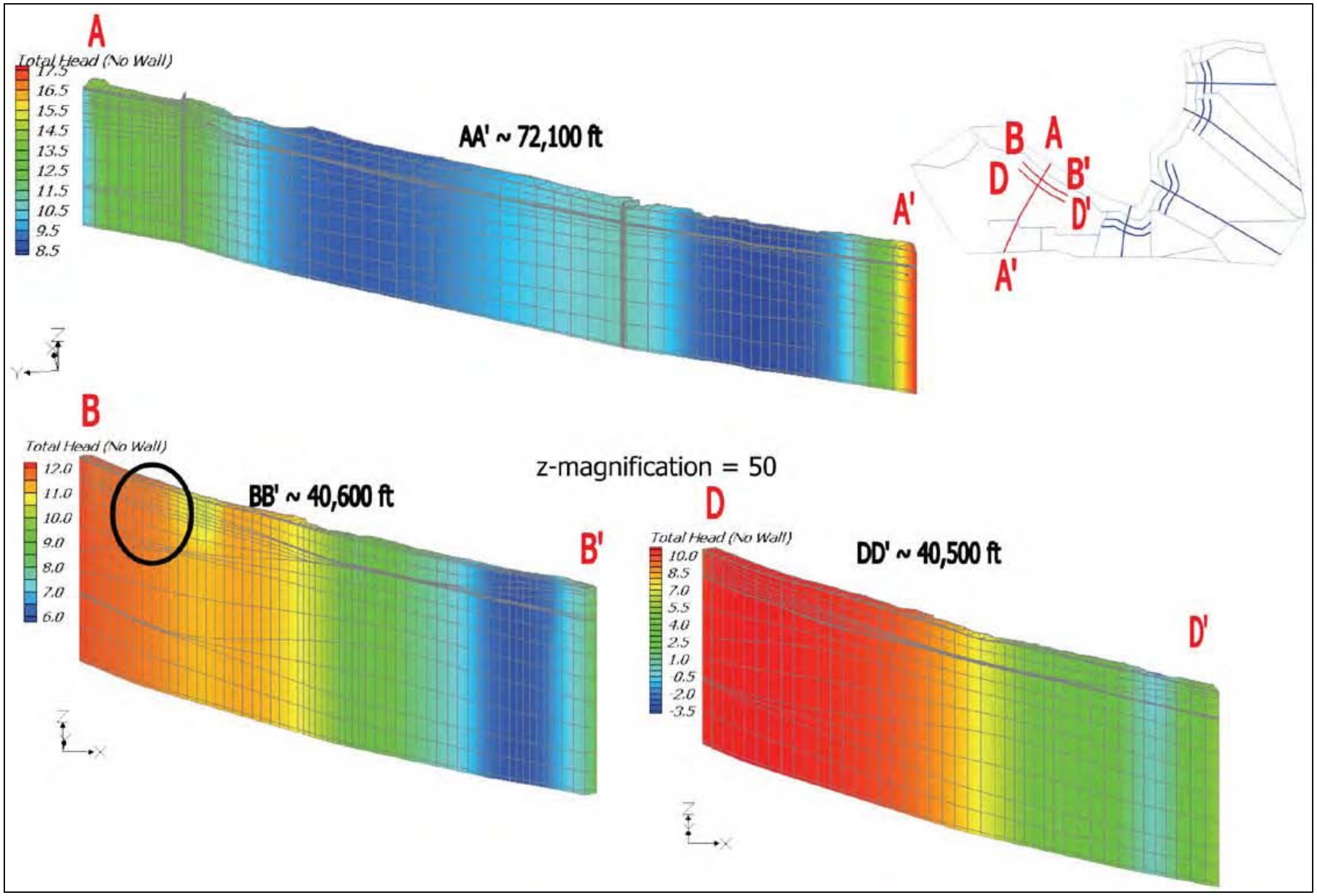

Figure 63. Total head color-fill contours on X2-P (upper left), X2-5K (lower left), and X2-10K (lower right) for Stage 1 "without project" base case run, i.e., Run 1.

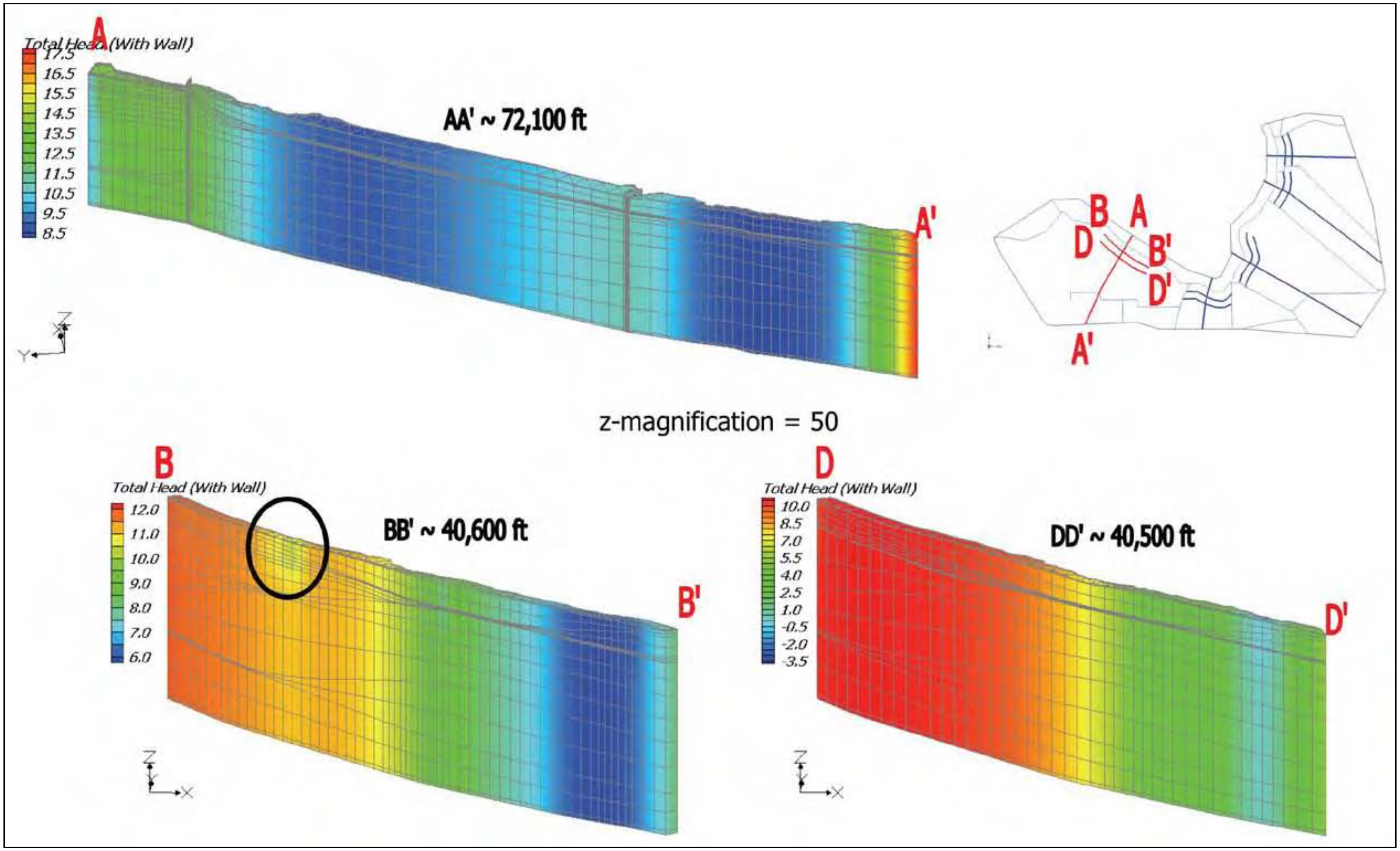

Figure 64. Total head color-fill contours on X2-P (upper left), X2-5K (lower left), and X2-10K (lower right) for Stage 1 "with project" base case run, i.e., Run 24.

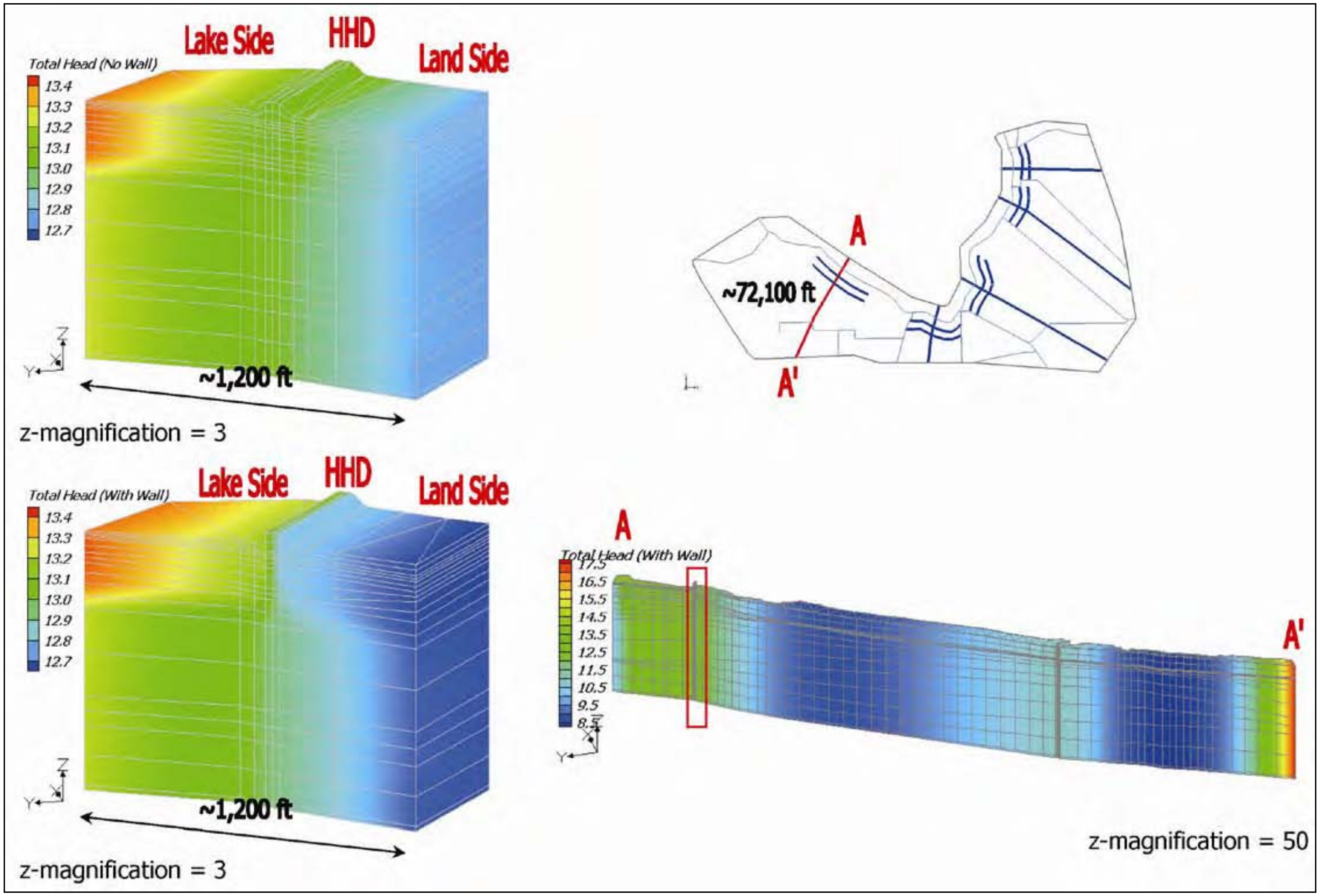

Figure 65. Stage 1 base case zoom-in comparison of total Head color-fill contour on X2-P between "without project" (Run 1, upper left) and "with project" (Run 24, lower left)

Stage 2 analysis

The comparison of groundwater flows through the 21 selected cross-sections for the 48 pairs, i.e., “without project” vs. “with project” considered in Stage 2 are made into 48 tables in Appendix D. Tables of Stage 2 Results of HHD Phase 1A model (Tables D1 through D48). The differences of cross-sectional flow from "without project" and "with project" model runs show the effect of cutoff wall. Each table provides information of (1) cross section ID, (2) cross section description, (3) cross-sectional flow rates of a pair of "without project" and "with project" model runs, (4) flow rate difference between the "without project" and "with project" model runs (w/ - w/o), (5) unit flow rate difference in cfd/ft, (6) average flow rate difference and unit difference for each reach, and (7) overall average flow rate difference and unit difference. The cross-sectional flow rate was defined to be positive if the net groundwater flow through the cross section moves in the direction away from Lake Okeechobee. A negative flow rate difference represents a reduction of cross-sectional flow rate when the cutoff wall is in place. Table 17 lists the comparison of overall average flow rates of the 48 pairs to provide an overview.

To help draw important information, Table 18 through 25, Table 28 through 30, and Tables 34 through 39 compare the overall average flow differences in various fashions, while Tables 26 and 27, and Tables 31 through 33 list the overall average flow rates of the "without project" runs in different manners. The major findings include the following.

Table 17. Ninety six model runs included in Stage 2 analysis (1/2).

Net Recharge & Head BC	Pumping	K_L21*	K_L3A*	K_L3B2*	w/o project		w/ project		Comparison	Overall Ave. Diff.	
					Model Run	Overall Avg. Flow	Model Run	Overall Avg. Flow		cfd	cfd/ft**
high	high	high	high	high	Run1	314420	Run49	220818	Run49 - Run1	-93601	-0.1899
high	high	high	low	high	Run2	113523	Run50	96213	Run50 - Run2	-17310	-0.0351
high	high	low	high	high	Run3	233159	Run51	167416	Run51 - Run3	-65743	-0.1334
high	high	low	low	high	Run4	99205	Run52	85382	Run52 - Run4	-13823	-0.0280
high	high	high	high	low	Run5	293683	Run53	120872	Run53 - Run5	-172811	-0.3507
high	high	high	low	low	Run6	78370	Run54	46337	Run54 - Run6	-32034	-0.0650
high	high	low	high	low	Run7	226286	Run55	113802	Run55 - Run7	-112484	-0.2282
high	high	low	low	low	Run8	72671	Run56	48936	Run56 - Run8	-23735	-0.0482
high	low	high	high	high	Run9	288502	Run57	200961	Run57 - Run9	-87541	-0.1776
high	low	high	low	high	Run10	105168	Run58	90293	Run58 - Run10	-14875	-0.0302
high	low	low	high	high	Run11	193530	Run59	136227	Run59 - Run11	-57303	-0.1163
high	low	low	low	high	Run12	81867	Run60	70819	Run60 - Run12	-11048	-0.0224
high	low	high	high	low	Run13	268671	Run61	110990	Run61 - Run13	-157681	-0.3200
high	low	high	low	low	Run14	79209	Run62	52574	Run62 - Run14	-26635	-0.0540
high	low	low	high	low	Run15	187345	Run63	95701	Run63 - Run15	-91644	-0.1860
high	low	low	low	low	Run16	66764	Run64	49412	Run64 - Run16	-17353	-0.0352
medium	high	high	high	high	Run17	219208	Run65	163599	Run65 - Run17	-55609	-0.1128
medium	high	high	low	high	Run18	80122	Run66	68325	Run66 - Run18	-11797	-0.0239
medium	high	low	high	high	Run19	165126	Run67	123088	Run67 - Run19	-42037	-0.0853
medium	high	low	low	high	Run20	71709	Run68	61362	Run68 - Run20	-10347	-0.0210
medium	high	high	high	low	Run21	206123	Run69	90235	Run69 - Run21	-115887	-0.2352

Net Recharge & Head BC	Pumping	K_L21*	K_L3A*	K_L3B2*	w/o project		w/ project		Comparison	Overall Ave. Diff.	
					Model Run	Overall Avg. Flow	Model Run	Overall Avg. Flow		cfd	cfd/ft**
medium	high	high	low	low	Run22	51370	Run70	28204	Run70 - Run22	-23166	-0.0470
medium	high	low	high	low	Run23	163676	Run71	84319	Run71 - Run23	-79357	-0.1610
medium	high	low	low	low	Run24	49528	Run72	30598	Run72 - Run24	-18930	-0.0384
medium	low	high	high	high	Run25	184895	Run73	136681	Run73 - Run25	-48214	-0.0978
medium	low	high	low	high	Run26	65528	Run74	56427	Run74 - Run26	-9101	-0.0185
medium	low	low	high	high	Run27	119615	Run75	86788	Run75 - Run27	-32827	-0.0666
medium	low	low	low	high	Run28	48951	Run76	41667	Run76 - Run28	-7285	-0.0148
medium	low	high	high	low	Run29	171344	Run77	72334	Run77 - Run29	-99010	-0.2009
medium	low	high	low	low	Run30	46577	Run78	29160	Run78 - Run30	-17416	-0.0353
medium	low	low	high	low	Run31	117385	Run79	60112	Run79 - Run31	-57273	-0.1162
medium	low	low	low	low	Run32	38803	Run80	26705	Run80 - Run32	-12098	-0.0245
low	high	high	high	high	Run33	42334	Run81	28318	Run81 - Run33	-14015	-0.0284
low	high	high	low	high	Run34	14137	Run82	11184	Run82 - Run34	-2953	-0.0060
low	high	low	high	high	Run35	41191	Run83	28623	Run83 - Run35	-12568	-0.0255
low	high	low	low	high	Run36	17194	Run84	14442	Run84 - Run36	-2752	-0.0056
low	high	high	high	low	Run37	43654	Run85	22950	Run85 - Run37	-20704	-0.0420
low	high	high	low	low	Run38	4084	Run86	-507	Run86 - Run38	-4592	-0.0093
low	high	low	high	low	Run39	42834	Run87	22726	Run87 - Run39	-20108	-0.0408
low	high	low	low	low	Run40	5481	Run88	690	Run88 - Run40	-4792	-0.0097
low	low**	high	high	high	Run41	9898	Run89	3093	Run89 - Run41	-6805	-0.0138
low	low	high	low	high	Run42	1174	Run90	50	Run90 - Run42	-1124	-0.0023
low	low	low	high	high	Run43	995	Run91	-3323	Run91 - Run43	-4317	-0.0088

Net Recharge & Head BC	Pumping	K_L21*	K_L3A*	K_L3B2*	w/o project		w/ project		Comparison	Overall Ave. Diff.	
					Model Run	Overall Avg. Flow	Model Run	Overall Avg. Flow		cfd	cfd/ft**
low	low	low	low	high	Run44	-1326	Run92	-2062	Run92 - Run44	-735	-0.0015
low	low	high	high	low	Run45	10234	Run93	1905	Run93 - Run45	-8328	-0.0169
low	low	high	low	low	Run46	1336	Run94	56	Run94 - Run46	-1280	-0.0026
low	low	low	high	low	Run47	2523	Run95	-711	Run95 - Run47	-3234	-0.0066
low	low	low	low	low	Run48	317	Run96	-435	Run96 - Run48	-752	-0.0015

*cfd = cubic feet per day

** The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/d

*** This column presents unit flow rate difference which is equal to flow rate difference divided by the corresponding reach length, where the reach length is 492,822 ft for combined reaches 1, 2, and 3.

Table 18. Average cross-sectional flow differences for the “with project” scenario in Stage 2 analysis: high recharge and head boundary conditions, high pumping.

Comparison	Reach 1 Avg. Diff.		Reach 2 Avg. Diff.		Reach 3 Avg. Diff.		Overall Avg. Diff.	
	cfd*	cfd/ft**	cfd	cfd/ft	cfd	cfd/ft	cfd	cfd/ft
Run49 - Run1	-123068	-0.3518	-138750	-1.2807	-18986	-0.5476	-93601	-0.1899
Run50 - Run2	-22874	-0.0654	-25241	-0.2330	-3814	-0.1100	-17310	-0.0351
Run51 - Run3	-90817	-0.2596	-95075	-0.8776	-11337	-0.3270	-65743	-0.1334
Run52 - Run4	-18686	-0.0534	-19627	-0.1812	-3156	-0.0910	-13823	-0.0280
Run53 - Run5	-251832	-0.7199	-184922	-1.7069	-81678	-2.3555	-172811	-0.3507
Run54 - Run6	-45987	-0.1315	-36979	-0.3413	-13135	-0.3788	-32034	-0.0650
Run55 - Run7	-165123	-0.4720	-121277	-1.1194	-51052	-1.4723	-112484	-0.2282
Run56 - Run8	-34715	-0.0992	-27110	-0.2502	-9380	-0.2705	-23735	-0.0482

* cfd = cubic feet per day.

numbers in red = greatest reduction of cross-sectional flow among the eight comparisons.

numbers in blue = least reduction of cross-sectional flow among the eight comparisons.

** This column presents unit flow rate difference which is equal to flow rate difference divided by the corresponding reach length, where the reach lengths are 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table 19. Average cross-sectional flow differences for the “with project” scenario in Stage 2 analysis: high recharge and head boundary conditions, low pumping.

Comparison	Reach 1 Avg. Diff.		Reach 2 Avg. Diff.		Reach 3 Avg. Diff.		Overall Avg. Diff.	
	cfd*	cfd/ft**	cfd	cfd/ft	cfd	cfd/ft	cfd	cfd/ft
Run57 - Run9	-112029	-0.3203	-131809	-1.2166	-18785	-0.5417	-87541	-0.1776
Run58 - Run10	-18223	-0.0521	-22631	-0.2089	-3773	-0.1088	-14875	-0.0302
Run59 - Run11	-76525	-0.2188	-84696	-0.7818	-10687	-0.3082	-57303	-0.1163
Run60 - Run12	-13568	-0.0388	-16593	-0.1532	-2983	-0.0860	-11048	-0.0224
Run61 - Run13	-216422	-0.6187	-176279	-1.6271	-80341	-2.3170	-157681	-0.3200
Run62 - Run14	-33905	-0.0969	-33080	-0.3053	-12919	-0.3726	-26635	-0.0540
Run63 - Run15	-119668	-0.3421	-108502	-1.0015	-46764	-1.3486	-91644	-0.1860
Run64 - Run16	-20720	-0.0592	-22639	-0.2090	-8699	-0.2509	-17353	-0.0352

* cfd = cubic feet per day.

numbers in red = greatest reduction of cross-sectional flow among the eight comparisons.

numbers in blue = least reduction of cross-sectional flow among the eight comparisons.

** This column presents unit flow rate difference which is equal to flow rate difference divided by the corresponding reach length, where the reach lengths are 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table 20. Average cross-sectional flow differences for the “with project” scenario in Stage 2 analysis: medium recharge and head boundary conditions, high pumping.

Comparison	Reach 1 Avg. Diff.		Reach 2 Avg. Diff.		Reach 3 Avg. Diff.		Overall Avg. Diff.	
	cfd*	cfd/ft**	cfd	cfd/ft	cfd	cfd/ft	cfd	cfd/ft
Run65 - Run17	-67702	-0.1935	-85401	-0.7883	-13723	-0.3957	-55609	-0.1128
Run66 - Run18	-15306	-0.0438	-17365	-0.1603	-2719	-0.0784	-11797	-0.0239
Run67 - Run19	-55366	-0.1583	-62336	-0.5754	-8411	-0.2426	-42037	-0.0853
Run68 - Run20	-14179	-0.0405	-14579	-0.1346	-2282	-0.0658	-10347	-0.0210
Run69 - Run21	-166979	-0.4773	-120931	-1.1162	-59752	-1.7232	-115887	-0.2352
Run70 - Run22	-33382	-0.0954	-26619	-0.2457	-9498	-0.2739	-23166	-0.0470
Run71 - Run23	-114861	-0.3284	-84228	-0.7774	-38982	-1.1242	-79357	-0.1610
Run72 - Run24	-28439	-0.0813	-21191	-0.1956	-7158	-0.2064	-18930	-0.0384

* cfd = cubic feet per day.

numbers in red = greatest reduction of cross-sectional flow among the eight comparisons.

numbers in blue = least reduction of cross-sectional flow among the eight comparisons.

** This column presents unit flow rate difference which is equal to flow rate difference divided by the corresponding reach length, where the reach lengths are 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table 21. Average cross-sectional flow differences for the “with project” scenario in Stage 2 analysis: medium recharge and head boundary conditions, low pumping.

Comparison	Reach 1 Avg. Diff.		Reach 2 Avg. Diff.		Reach 3 Avg. Diff.		Overall Avg. Diff.	
	cfd*	cfd/ft**	cfd	cfd/ft	cfd	cfd/ft	cfd	cfd/ft
Run73 - Run25	-54004	-0.1544	-77120	-0.7118	-13517	-0.3898	-48214	-0.0978
Run74 - Run26	-9974	-0.0285	-14658	-0.1353	-2672	-0.0771	-9101	-0.0185
Run75 - Run27	-39354	-0.1125	-51382	-0.4743	-7744	-0.2233	-32827	-0.0666
Run76 - Run28	-8368	-0.0239	-11383	-0.1051	-2103	-0.0607	-7285	-0.0148
Run77 - Run29	-128643	-0.3678	-110087	-1.0161	-58301	-1.6813	-99010	-0.2009
Run78 - Run30	-20665	-0.0591	-22351	-0.2063	-9233	-0.2663	-17416	-0.0353
Run79 - Run31	-67499	-0.1930	-69782	-0.6441	-34538	-0.9961	-57273	-0.1162
Run80 - Run32	-13602	-0.0389	-16266	-0.1501	-6426	-0.1853	-12098	-0.0245

* cfd = cubic feet per day.

numbers in red = greatest reduction of cross-sectional flow among the eight comparisons.

numbers in blue = least reduction of cross-sectional flow among the eight comparisons.

** This column presents unit flow rate difference which is equal to flow rate difference divided by the corresponding reach length, where the reach lengths are 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table 22. Average cross-sectional flow differences in Stage 2 analysis: low recharge and head boundary conditions, high pumping.

Comparison	Reach 1 Avg. Diff.		Reach 2 Avg. Diff.		Reach 3 Avg. Diff.		Overall Avg. Diff.	
	cfd*	cfd/ft**	cfd	cfd/ft	cfd	cfd/ft	cfd	cfd/ft
Run81 - Run33	-21746	-0.0622	-18855	-0.1740	-1445	-0.0417	-14015	-0.0284
Run82 - Run34	-5039	-0.0144	-3522	-0.0325	-297	-0.0086	-2953	-0.0060
Run83 - Run35	-22716	-0.0649	-14713	-0.1358	-275	-0.0079	-12568	-0.0255
Run84 - Run36	-5282	-0.0151	-2857	-0.0264	-118	-0.0034	-2752	-0.0056
Run85 - Run37	-33203	-0.0949	-23787	-0.2196	-5122	-0.1477	-20704	-0.0420
Run86 - Run38	-8213	-0.0235	-4858	-0.0448	-704	-0.0203	-4592	-0.0093
Run87 - Run39	-41163	-0.1177	-17523	-0.1617	-1638	-0.0473	-20108	-0.0408
Run88 - Run40	-9707	-0.0278	-4240	-0.0391	-429	-0.0124	-4792	-0.0097

* cfd = cubic feet per day.

numbers in red = greatest reduction of cross-sectional flow among the eight comparisons.

numbers in blue = least reduction of cross-sectional flow among the eight comparisons.

** This column presents unit flow rate difference which is equal to flow rate difference divided by the corresponding reach length, where the reach lengths are 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table 23. Average cross-sectional flow differences in Stage 2 analysis: low recharge and head boundary conditions, low pumping.

Comparison	Reach 1 Avg. Diff.		Reach 2 Avg. Diff.		Reach 3 Avg. Diff.		Overall Avg. Diff.	
	cfd*	cfd/ft**	cfd	cfd/ft	cfd	cfd/ft	cfd	cfd/ft
Run89 - Run41	-8161	-0.0233	-10963	-0.1012	-1292	-0.0373	-6805	-0.0138
Run90 - Run42	-1301	-0.0037	-1807	-0.0167	-264	-0.0076	-1124	-0.0023
Run91 - Run43	-7538	-0.0215	-5528	-0.0510	114	0.0033	-4317	-0.0088
Run92 - Run44	-1248	-0.0036	-915	-0.0084	-43	-0.0012	-735	-0.0015
Run93 - Run45	-7214	-0.0206	-13341	-0.1231	-4430	-0.1278	-8328	-0.0169
Run94 - Run46	-1171	-0.0033	-2065	-0.0191	-604	-0.0174	-1280	-0.0026
Run95 - Run47	-5019	-0.0143	-5175	-0.0478	492	0.0142	-3234	-0.0066
Run96 - Run48	-987	-0.0028	-1100	-0.1012	-168	-0.0049	-752	-0.0015

* cfd = cubic feet per day.

numbers in red = greatest reduction of cross-sectional flow among the eight comparisons.

numbers in blue = least reduction of cross-sectional flow among the eight comparisons.

** This column presents unit flow rate difference which is equal to flow rate difference divided by the corresponding reach length, where the reach lengths are 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table 24. Overall average cross-sectional flow differences in Stage 2 analysis: high pumping.

Hydraulic Conductivity*			Low Recharge & Head BC		Medium Recharge & Head BC		High Recharge & Head BC	
L2-1	L3A	L3B-2	Comparison	Flow Diff. in cfd	Comparison	Flow Diff. in cfd	Comparison	Flow Diff. in cfd
high	high	high	Run81 - Run33	-14015	Run65 - Run17	-55609	Run49 - Run1	-93601
high	low	high	Run82 - Run34	-2953	Run66 - Run18	-11797	Run50 - Run2	-17310
low	high	high	Run83 - Run35	-12568	Run67 - Run19	-42037	Run51 - Run3	-65743
low	low	high	Run84 - Run36	-2752	Run68 - Run20	-10347	Run52 - Run4	-13823
high	high	low	Run85 - Run37	-20704	Run69 - Run21	-115887	Run53 - Run5	-172811
high	low	low	Run86 - Run38	-4592	Run70 - Run22	-23166	Run54 - Run6	-32034
low	high	low	Run87 - Run39	-20108	Run71 - Run23	-79357	Run55 - Run7	-112484
low	low	low	Run88 - Run40	-4792	Run72 - Run24	-18930	Run56 - Run8	-23735

cfd = cubic feet per day

numbers in red = greatest reduction of cross-sectional flow among the eight comparisons

numbers in blue = least reduction of cross-sectional flow among the eight comparisons

* The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/d

Table 25. Overall average cross-sectional flow differences in Stage 2 analysis: low pumping.

Hydraulic Conductivity*			Low Recharge & Head BC		Medium Recharge & Head BC		High Recharge & Head BC	
L2-1	L3A	L3B-2	Comparison	Flow Diff. in cfd	Comparison	Flow Diff. in cfd	Comparison	Flow Diff. in cfd
high	high	high	Run89 - Run41	-6805	Run73 - Run25	-48214	Run57 - Run9	-87541
high	low	high	Run90 - Run42	-1124	Run74 - Run26	-9101	Run58 - Run10	-14875
low	high	high	Run91 - Run43	-4317	Run75 - Run27	-32827	Run59 - Run11	-57303
low	low	high	Run92 - Run44	-735	Run76 - Run28	-7285	Run60 - Run12	-11048
high	high	low	Run93 - Run45	-8328	Run77 - Run29	-99010	Run61 - Run13	-157681
high	low	low	Run94 - Run46	-1280	Run78 - Run30	-17416	Run62 - Run14	-26635
low	high	low	Run95 - Run47	-3234	Run79 - Run31	-57273	Run63 - Run15	-91644
low	low	low	Run96 - Run48	-752	Run80 - Run32	-12098	Run64 - Run16	-17353

cfd = cubic feet per day

numbers in red = greatest reduction of cross-sectional flow among the eight comparisons

numbers in blue = least reduction of cross-sectional flow among the eight comparisons

* The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/d

Table 26. "Without project" Overall average cross-sectional flow rates in Stage 2 analysis: high pumping.

Hydraulic Conductivity*			Low Recharge & Head BC		Medium Recharge & Head BC		High Recharge & Head BC	
L2-1	L3A	L3B-2	Run ID	Flow rate in cfd	Run ID	Flow rate in cfd	Run ID	Flow rate in cfd
high	high	high	33	42334	17	219208	1	314420
high	low	high	34	14137	18	80122	2	113523
low	high	high	35	41191	19	165126	3	233159
low	low	high	36	17194	20	71709	4	99205
high	high	low	37	43654	21	206123	5	293683
high	low	low	38	4084	22	51370	6	78370
low	high	low	39	42834	23	163676	7	226286
low	low	low	40	5481	24	49528	8	72671

cfd = cubic feet per day

* The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/d

Table 27. "Without project" Overall average cross-sectional flow rates in Stage 2 analysis: low pumping.

Hydraulic Conductivity*			Low Recharge & Head BC		Medium Recharge & Head BC		High Recharge & Head BC	
L2-1	L3A	L3B-2	Run ID	Flow rate in cfd	Run ID	Flow rate in cfd	Run ID	Flow rate in cfd
high	high	high	41	9898	25	184895	9	288502
high	low	high	42	1174	26	65528	10	105168
low	high	high	43	995	27	119615	11	193530
low	low	high	44	-1326	28	48951	12	81867
high	high	low	45	10234	29	171344	13	268671
high	low	low	46	1336	30	46577	14	79209
low	high	low	47	2523	31	117385	15	187345
low	low	low	48	317	32	38803	16	66764

cfd = cubic feet per day

* The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/d

Table 28. Overall average cross-sectional flow differences in Stage 2 analysis: high recharge and head boundary conditions.

Hydraulic Conductivity*			Low Pumping		High Pumping	
L2-1	L3A	L3B-2	Comparison	Flow Difference in cfd	Comparison	Flow Difference in cfd
high	high	high	Run57 - Run9	-55609	Run49 - Run1	-93601
high	low	high	Run58 - Run10	-11797	Run50 - Run2	-17310
low	high	high	Run59 - Run11	-42037	Run51 - Run3	-65743
low	low	high	Run60 - Run12	-10347	Run52 - Run4	-13823
high	high	low	Run61 - Run13	-115887	Run53 - Run5	-172811
high	low	low	Run62 - Run14	-23166	Run54 - Run6	-32034
low	high	low	Run63 - Run15	-79357	Run55 - Run7	-112484
low	low	low	Run64 - Run16	-18930	Run56 - Run8	-23735

cfd = cubic feet per day

* The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/d

Table 29. Overall average cross-sectional flow differences in Stage 2 analysis: medium recharge and head boundary conditions.

Hydraulic Conductivity*			Low Pumping		High Pumping	
L2-1	L3A	L3B-2	Comparison	Flow Diff. in cfd	Comparison	Flow Diff. in cfd
high	high	high	Run73 - Run25	-48214	Run65 - Run17	-55609
high	low	high	Run74 - Run26	-9101	Run66 - Run18	-11797
low	high	high	Run75 - Run27	-32827	Run67 - Run19	-42037
low	low	high	Run76 - Run28	-7285	Run68 - Run20	-10347
high	high	low	Run77 - Run29	-99010	Run69 - Run21	-115887
high	low	low	Run78 - Run30	-17416	Run70 - Run22	-23166
low	high	low	Run79 - Run31	-57273	Run71 - Run23	-79357
low	low	low	Run80 - Run32	-12098	Run72 - Run24	-18930

cfd = cubic feet per day

* The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/d

Table 30. Overall average cross-sectional flow differences in Stage 2 analysis: low recharge and head boundary conditions.

Hydraulic Conductivity*			Low Pumping		High Pumping	
L2-1	L3A	L3B-2	Comparison	Flow Diff. in cfd	Comparison	Flow Diff. in cfd
high	high	high	Run89 - Run41	-6805	Run81 - Run33	-14015
high	low	high	Run90 - Run42	-1124	Run82 - Run34	-2953
low	high	high	Run91 - Run43	-4317	Run83 - Run35	-12568
low	low	high	Run92 - Run44	-735	Run84 - Run36	-2752
high	high	low	Run93 - Run45	-8328	Run85 - Run37	-20704
high	low	low	Run94 - Run46	-1280	Run86 - Run38	-4592
low	high	low	Run95 - Run47	-3234	Run87 - Run39	-20108
low	low	low	Run96 - Run48	-752	Run88 - Run40	-4792

cfd = cubic feet per day

* The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/d

Table 31. "Without project" Overall average cross-sectional flow rates in Stage 2 analysis: high recharge and head boundary conditions.

Hydraulic Conductivity*			Low Pumping		High Pumping		Flow Increase from Low to High Pumping	
L2-1	L3A	L3B-2	Run ID	Flow rate in cfd	Run ID	Flow rate in cfd	cfd**	cfd/ft***
High	high	high	9	288502	1	314420	25918	0.0526
High	low	high	10	105168	2	113523	8355	0.0170
Low	high	high	11	193530	3	233159	39629	0.0804
Low	low	high	12	81867	4	99205	17338	0.0352
High	high	low	13	268671	5	293683	25012	0.0508
High	low	low	14	79209	6	78370	-839	-0.0017
Low	high	low	15	187345	7	226286	38941	0.0790
Low	low	low	16	66764	8	72671	5907	0.0120

* The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/d

** cfd = cubic feet per day

** This column presents unit flow rate difference which is equal to flow rate difference divided by the corresponding reach length, where the reach length is 492,822 ft for combined reaches 1, 2, and 3.

Table 32. "Without project" Overall average cross-sectional flow rates in Stage 2 analysis: high recharge and head boundary conditions.

Hydraulic Conductivity*			Low Pumping		High Pumping		Flow Increase from Low to High Pumping	
L2-1	L3A	L3B-2	Run ID	Flow rate in cfd	Run ID	Flow rate in cfd	cfd**	cfd/ft***
high	high	high	25	184895	17	219208	34313	0.0696
high	low	high	26	65528	18	80122	14594	0.0296
low	high	high	27	119615	19	165126	45511	0.0923
low	low	high	28	48951	20	71709	22758	0.0462
high	high	low	29	171344	21	206123	34779	0.0706
high	low	low	30	46577	22	51370	4793	0.0097
low	high	low	31	117385	23	163676	46291	0.0939
low	low	low	32	38803	24	49528	10725	0.0218

* The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/d

** cfd = cubic feet per day

** This column presents unit flow rate difference which is equal to flow rate difference divided by the corresponding reach length, where the reach length is 492,822 ft for combined reaches 1, 2, and 3.

Table 33. "Without project" Overall average cross-sectional flow rates in Stage 2 analysis: high recharge and head boundary conditions.

Hydraulic Conductivity*			Low Pumping		High Pumping		Flow Increase from Low to High Pumping	
L2-1	L3A	L3B-2	Run ID	Flow rate in cfd	Run ID	Flow rate in cfd	cfd**	cfd/ft***
high	high	high	41	9898	33	42334	32436	0.0658
high	low	high	42	1174	34	14137	12963	0.0263
low	high	high	43	995	35	41191	40196	0.0816
low	low	high	44	-1326	36	17194	18520	0.0376
high	high	low	45	10234	37	43654	33420	0.0678
high	low	low	46	1336	38	4084	2748	0.0056
low	high	low	47	2523	39	42834	40311	0.0818
low	low	low	48	317	40	5481	5164	0.0105

* The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/d

** cfd = cubic feet per day

** This column presents unit flow rate difference which is equal to flow rate difference divided by the corresponding reach length, where the reach length is 492,822 ft for combined reaches 1, 2, and 3.

1. The impact of cutoff wall on hydraulic head decreased with the distance away from HHD. Figure 66 marks the computational nodes with head differences greater than 0.1 ft in four pairs of comparison, where Run 53 (with project) and Run 5 (without project) had the greatest overall average cross-sectional flow difference among the 48 pairs considered in Stage 2 analysis, while the other three pairs of comparison used the same set of K values but different combinations of pumping and net recharge and head boundary conditions. Nodes with head differences between 0.1 and 0.5 ft, between 0.5 and 1 ft, 1 and 2 ft, and greater than 2 ft are highlighted in blue, green, yellow, and red, respectively. It is seen in Figure 66 that the head difference caused by the cutoff wall was reduced to less than 0.1 ft after some distances from HHD on the land side, and this distance varied at different sections of HHD. It also varied with the pumping, the net recharge and head boundary conditions, given a set of hydraulic conductivities. Although subsurface flow may be more sensitive to the cutoff wall than hydraulic head, it is reasonable to say the cutoff wall impact on cross-sectional flow will become limited when the cross-section of interest is sufficiently far away from HHD. It is noted in Figure 66 that great withdrawal near HHD can also generate large head differences as shown in the two plots on the left. It is noted that that in the lower right pane of Figure 66 that the low head boundary conditions simulation comparison results in changes in flow towards Lake Okeechobee not away from it, since Lake Okeechobee is acting as a groundwater sink in these conditions not a source. Similar plots for the head differences of the 48 pairs considered in Stage 2 analysis are provided in Appendix F. Also included in Appendix F, there are six tables (Tables F1 through F6) showing the distribution of percentage occurrences of head difference for the 48 pairs of comparison. The magnitudes of the mean absolute error (MA Error), the root mean square error (RMS Error), and the maximun absolute error (Max Error) are given in the last three columns of these tables. A discussion on these errors can be found in Appendix F.
2. While Figure 66 provides a top view of the head difference distribution, Figure 67 plots the distribution of head difference between Run 53 and Run 3 on five cross sections: X = 631,000, Y = 856,000, Y = 961,000, Z = -231, and Z = -41. The transparent feature is activated on the X slice and the two Y slices to allow seeing through. It is obvious that the head difference varies with depth at some locations near the HHD, e.g., where marked with red circles, suggesting significant vertical flow in the vicinity of the HHD when the cutoff wall is present.

3. The overall average cross-sectional flows were reduced by 11,000 to 173,000 cubit feet per day (cfd) or by 0.02 to 0.35 cfd per unit length of HHD (cfd/ft-HHD) at the high condition (see Tables 18 and 19); by 7,000 to 116,000 cfd or by 0.01 to 0.24 cfd/ft-HHD at the medium condition (see Tables 20 and 21), and by 730 to 21,000 cfd or by less than 0.01 (i.e., insignificant) to 0.04 cfd/ft-HHD at the low condition (see Tables 22 and 23) when the wall exists. Although the reduction in overall average cross-sectional flow can be as high as 21,000 cfd (Run 37 vs. Run 85) at low condition (Table 23), the reduced flow rate was much lower than that at either the medium or the high condition. This is because higher net recharge and head boundary conditions applied to the model generated higher overall average cross-sectional flows. For example, the overall average cross-sectional flow rate of the "without project" model run was 995 cfd at the low condition (Run 43 in Table 17, row highlighted in yellow), 119,615 cfd medium condition (Run 27 in Table 17, row high-lighted in red), and 193,530 cfd high condition (Run 11 in Table 17, row highlighted in blue), where the same set of K values and pumping were applied. This suggests that the reduction rate should be used to evaluate the cutoff wall impact.

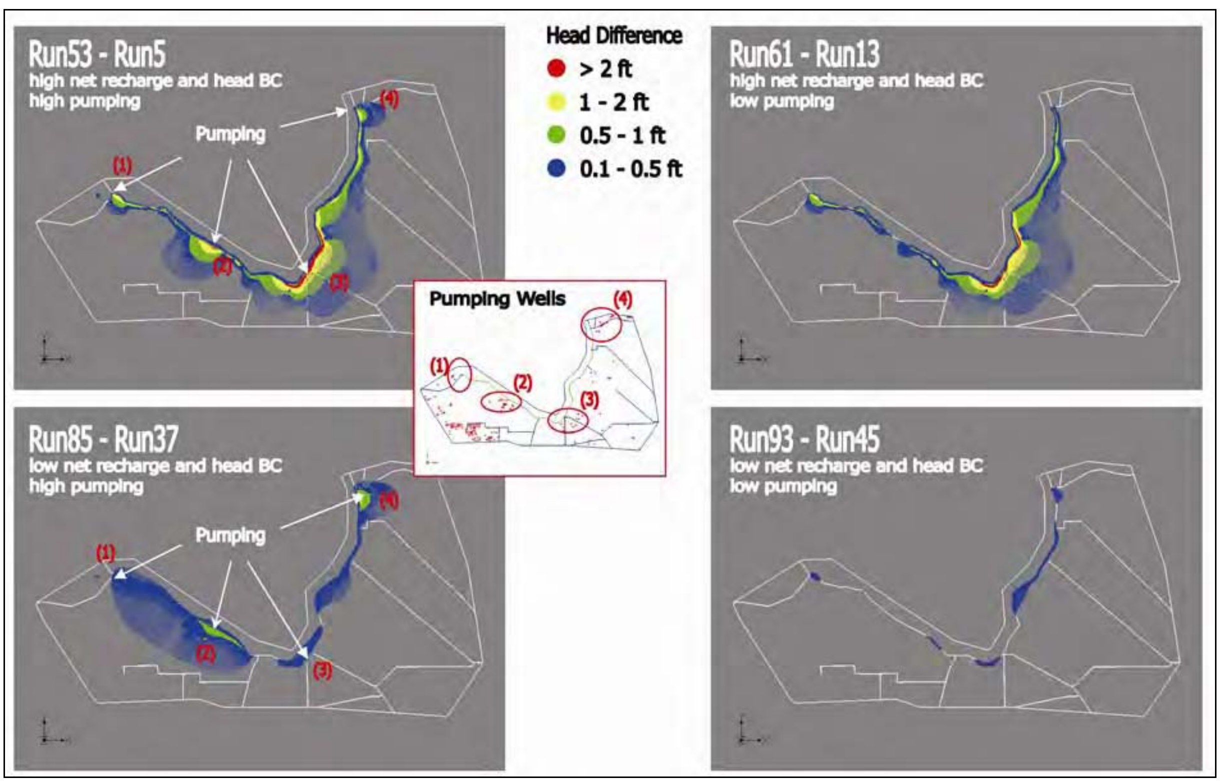

Figure 66. Hydraulic head difference distribution when the high K values of Materials L2-1 and L3A and the low K value of Material L3B-2 were used in Stage 2 analysis: different combination of net recharge and head boundary conditions and pumping are compared.

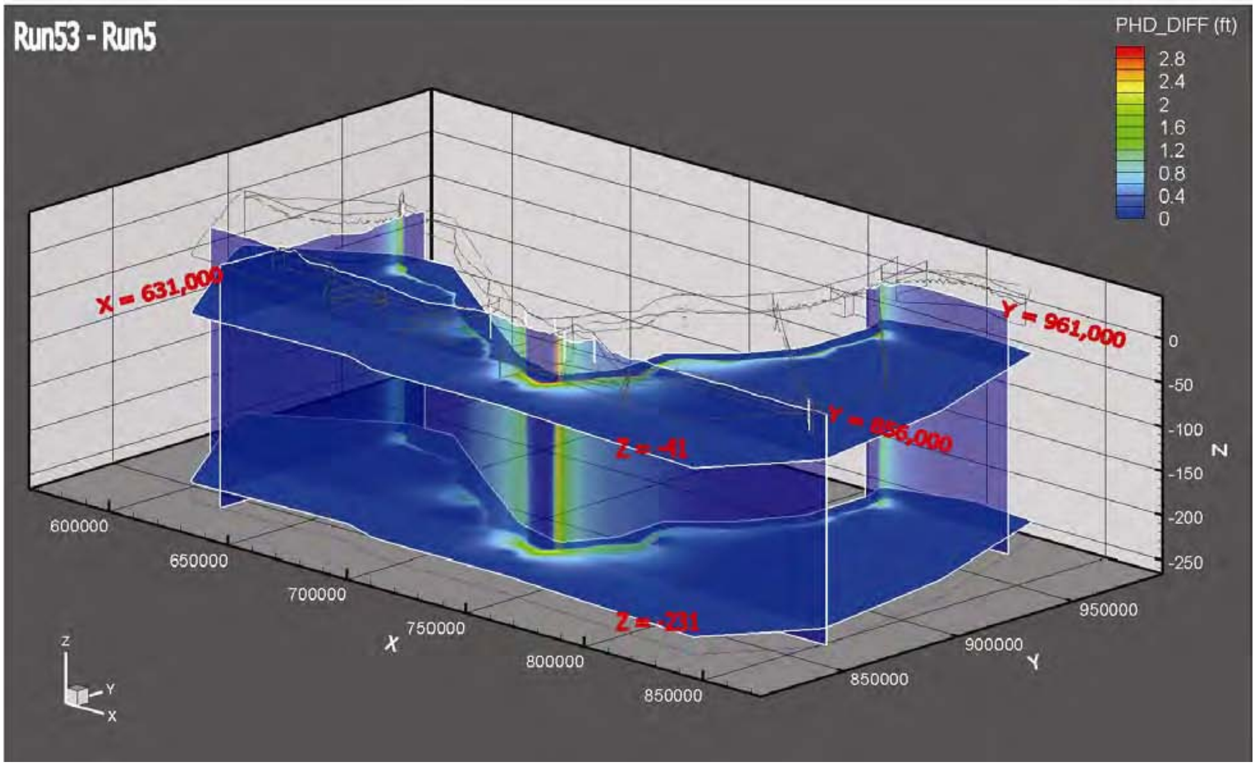

Figure 67. Distribution of hydraulic head difference between Run 53 and Run 5 in Stage 2 analysis on five cross sections: X = 631,000, Y = 856,000, Y = 961,000, Z = -231, and Z = -41.

4. The flow difference, in cfd, varied widely with reaches and the combination of the three K values of Materials L2-1, L3A, and L3B-2 under a given set of pumping, net recharge, and head boundary conditions (Tables 18 through 23), indicating the cross-sectional flow difference was sensitive to both the location of the cross sections of interest and the three subsurface materials in the hydro-geologic model. This suggests the necessity of a sufficiently accurate hydro-geological model and being specific in defining the cross-sections of interest.
5. The reduction of overall average cross-sectional flow increased when the net recharge and head boundary conditions applied was from low to high (Tables 24 and 25). Because higher net recharge and head boundary conditions defined in this study generated higher overall average cross-sectional flows than lower net recharge and head boundary conditions (Tables 26 and 27), the magnitude of the cutoff wall effect depended highly on the recharge and boundary conditions applied.
6. The reduction of overall average cross-sectional flow increased from low pumping, i.e., zero pumping rate, to high pumping, i.e., when pumps were operated at their full capacities (Tables 28 through 30). Consistently higher overall average cross-sectional flows were observed when permit-capacity pumping was applied (Tables 31 through 33) because greater

hydraulic gradients due to pumping were created. Pumping effects became more evident as net recharge and head boundary conditions were lowered (see the column of Flow Increase from Low to High Pumping in Tables 31 through 33).

7. The reduction of overall average cross-sectional flow increased with the conductivity of Materials L2-1 and L3A, but decreased with the conductivity of Material L3B-2 (Tables 34 through 39). This is also obvious in Tables 24 and 25, where the greatest reduction of cross-sectional flow occurred when the high K values of Materials L2-1 and L3A and the low K value of Material L3B-2 were used (the row with letters and numbers highlighted in red), and the least reduction happened when the low K values of Materials L2-1 and L3A and the high K value of Material L3B-2 were employed (the row with letters and numbers highlighted in blue). A close examination on the flow differences in Tables 34 through 39 determines that Material L3A, among the three materials, had the greatest impact on the reduction of overall aveage cross-sectional flow, while Material L2-1 had the least impact.
8. Figure 62 shows increased velocities in L3B-2 which is resulting from cutting off the flow in L3A. In this case, the velocity increase around the tip of the cutoff wall is substantial, suggesting that the depth of the cutoff wall plays a crucial role for the flow regime in the vicinity of HHD.

Table 34. Sorted overall average cross-sectional flow differences in Stage 2 analysis: high recharge and head boundary conditions, high pumping.

Hydraulic Conductivity*				
L2-1	L3A	L3B-2	Comparison	Flow Difference in cfd (w/ - w/o)
high	high	low	Run53 - Run5	-172811
low	high	low	Run55 - Run7	-112484
high	high	high	Run49 - Run1	-93601
low	high	high	Run51 - Run3	-65743
high	low	low	Run54 - Run6	-32034
low	low	low	Run56 - Run8	-23735
high	low	high	Run50 - Run2	-17310
low	low	high	Run52 - Run4	-13823

cfd = cubic feet per day

* The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/d

Table 35. Sorted overall average cross-sectional flow differences in Stage 2 analysis: high recharge and head boundary conditions, low pumping.

Hydraulic Conductivity*			Comparison	Flow Difference in cfd (w/ - w/o)
L2-1	L3A	L3B-2		
high	high	low	Run61 - Run13	-157681
low	high	low	Run63 - Run15	-91644
high	high	high	Run57 - Run9	-87541
low	high	high	Run59 - Run11	-57303
high	low	low	Run62 - Run14	-26635
low	low	low	Run64 - Run16	-17353
high	low	high	Run58 - Run10	-14875
low	low	high	Run60 - Run12	-11048

cfd = cubic feet per day

* The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/d

Table 36. Sorted overall average cross-sectional flow differences in Stage 2 analysis: medium recharge and head boundary conditions, high pumping.

Hydraulic Conductivity*			Comparison	Flow Difference in cfd (w/ - w/o)
L2-1	L3A	L3B-2		
high	high	low	Run69 - Run21	-115887
low	high	low	Run71 - Run23	-79357
high	high	high	Run65 - Run17	-55609
low	high	high	Run67 - Run19	-42037
high	low	low	Run70 - Run22	-23166
low	low	low	Run72 - Run24	-18930
high	low	high	Run66 - Run18	-11797
low	low	high	Run68 - Run20	-10347

cfd = cubic feet per day

* The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/d

Table 37. Sorted overall average cross-sectional flow differences in Stage 2 analysis: medium recharge and head boundary conditions, low pumping.

Hydraulic Conductivity*				
L2-1	L3A	L3B-2	Comparison	Flow Difference in cfd (w/ - w/o)
high	high	low	Run77 - Run29	-99010
low	high	low	Run79 - Run31	-57273
high	high	high	Run73 - Run25	-48214
low	high	high	Run75 - Run27	-32827
high	low	low	Run78 - Run30	-17416
low	low	low	Run80 - Run32	-12098
high	low	high	Run74 - Run26	-9101
low	low	high	Run76 - Run28	-7285

cfd = cubic feet per day

* The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/d

Table 38. Sorted overall average cross-sectional flow differences in Stage 2 analysis: low recharge and head boundary conditions, high pumping.

Hydraulic Conductivity*				
L2-1	L3A	L3B-2	Comparison	Flow Difference in cfd (w/ - w/o)
high	high	low	Run85 - Run37	-20704
low	high	low	Run87 - Run39	-20108
high	high	high	Run81 - Run33	-14015
low	high	high	Run83 - Run35	-12568
low	low	low	Run88 - Run40	-4792
low	low	low	Run86 - Run38	-4592
high	low	high	Run82 - Run34	-2953
low	low	high	Run84 - Run36	-2752

cfd = cubic feet per day

* The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/d

Table 39. Sorted overall average cross-sectional flow differences in Stage 2 analysis: low recharge and head boundary conditions, low pumping.

Hydraulic Conductivity*				
L2-1	L3A	L3B-2	Comparison	Flow Difference in cfd (w/ - w/o)
high	high	low	Run93 - Run45	-8328
high	high	high	Run89 - Run41	-6805
low	high	high	Run91 - Run43	-4317
low	high	low	Run95 - Run47	-3234
high	low	low	Run94 - Run46	-1280
high	low	high	Run90 - Run42	-1124
low	low	low	Run96 - Run48	-752
low	low	high	Run92 - Run44	-735

cfd = cubic feet per day

* The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/d

The QA/QC procedures for simulation results and post-processed data

Several QA/QC procedures were followed to maintain the integrity of sensitivity simulation results. One directory was generated for each of the 46 model runs in Stage 1 and 98 model runs in Stage 2. Each directory stored all input files and output files associated with a specific model run. Each file was named systematically so that it is easy to be recognized and examined. Likewise, the post-processed data used for analysis were prepared accordingly for each model run. ERDC had multiple individuals verify that all input files were correct before the model runs were launched. The reasonableness of the simulation results and post-processed data was also examined during the review processes conducted in ERDC, NAP, and SAJ.

6 Conclusions and Next-Step Suggestions

Based on the results of the two-stage analysis conducted in this project, the following conclusions can be drawn.

1. The impact of the cutoff wall on hydraulic head decreased with the distance away from HHD. The hydro-static (no vertical flow) condition did not exist in the vicinity of HHD when the cutoff wall was in place (see details in Section 5.2).
2. With the net recharge and head boundary conditions defined based on the historical data, the pressure head was reduced due to installation of the cutoff wall, on the average, by about 0.02 to 0.31 ft (see the MA Diff column in Tables F1 and F2) at the high condition, by about 0.01 to 0.28 ft at the medium condition (see the MA Diff column in Tables F3 and F4), and by 0.01 to 0.21 ft at the low condition (see the MA Diff column in Tables F5 and F6).
3. Given the hydro-geologic model constructed in the project, Materials L2-1, L3A, and L3B-2 were more influential than the other eight subsurface materials on the groundwater flows through the 21 cross-sections of interest (see details in Section 5.1).
4. The overall average cross-sectional flow difference that accounts for the cutoff wall impact, increased with the hydraulic conductivity values of Materails L2-1 and L3A, but decreased with the hydraulic conductivity value of Material L3B-2 (see details in Section 5.1).
5. The overall average cross-sectional flows were reduced by 0.02 to 0.35 cfd per unit length of HHD (cfd/ft) at the high condition (see Tables 18 and 19), 0.01 to 0.24 cfd/ft at the medium condition (see Tables 20 and 21), and less than 0.01 (i.e., insignificant) to 0.04 cfd/ft at the low condition (see Tables 22 and 23) when the wall is in place (see details in Section 5.2).
6. The magnitude of cutoff wall impact on the groundwater head with the model domain depends on the location of interest (see details in Section 5.2).
7. Boundary conditions and source/sink terms (i.e., pumping wells and surface water bodies) applied to the model will also affect the magnitude of the cutoff wall impact (see details in Section 5.2).
8. Given the 21 specified cross-sections in this project, the reduction of overall average cross-sectional flow resulting from the cutoff wall

increased with pumping, especially in those wells close to HHD. (see details in Section 5.2)

9. The groundwater velocity increased around the lower tip of the cutoff wall in the "with project" simulation. Additional geotechnical evaluations may be warrented to determine if this increase in velocity would result in an increase in the potential for piping of the materials in this area. (see details in Section 5.2)

As stated in the SOW of the project, the goal of this HHD Phase IA steady-state modeling was to indicate the magnitude of impact a cutoff wall would have on the sub-regional groundwater. The modeling provides a range of potential impacts utilizing an array of hydrologic scenarios, rather than a calibrated analysis, of how the cutoff wall would impact the sub-regional groundwater. It is to also identify important factors for refined, design-level analysis in the future if determined necessary. It was understood that additional coordination among SAJ, ERDC, and NAP would need to occur to integrate the model results with the performance measures by which SAJ intends to evaluate the HHD rehabilitation effort. Without this coordination and without input from SAJ's experts, it will be difficult for the ERDC and NAP modelers to determine if the modeled impacts are significant and adverse. This coordination between SAJ and the modelers is also necessary to ensure that model results are not inadvertently misinterpreted.

The next step in this process involved the modelers and SAJ's HHD experts, including representatives from its Office of Counsel, meeting to discuss the comments (and responses) that were generated on the Phase IA modeling report. This meeting was intended to bring the team to a consensus on the "significance" of the impact to sub-regional groundwater flow resulting from the proposed cutoff wall. If impacts are determined to be significant and adverse, two courses of action are possible. The first would be an evaluation of the existing systems (gate/canal/pumping networks) to determine if potential impacts can be mitigated through changes to the existing operational rules, including making surface water available to a user to compensate for any loss in groundwater supply. If this is not plausible and additional information is needed to quantify the potential impacts, additional transient modeling could be pursued as described in the original modeling scope (see in Appendices A and B). However, the issue of whether this modeling might proceed would depend on the specific questions that SAJ needs to have answered and the sufficient availability of data that would be needed to construct a calibrated and validated transient model.

7 Acknowledgments

This report is part of a study prepared for and in cooperation with SAJ. Thanks are given to the SAJ Geotechnical and Water Management Sections for their cooperation and technical assistance during this study.

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Appendix A. Scope of Work for Development of the Phase 1A Lake Okeechobee Sub-regional Groundwater Numerical Model

Background

Built in the 1930s and extending for approximately 140 miles, the Herbert Hoover Dike defines the perimeter of and retains the surface waters of Lake Okeechobee. The Herbert Hoover Dike, named to commemorate President Herbert Hoover, and built in the wake of several destructive hurricanes occurring over central Florida, provides flood control protection for the inhabitants and structures associated with the many communities that border the Lake. The dike was built with gravel, rock, limestone, sand and shell, in conformance with design criteria that were state-of-the-art in the 1930s. In recent years, the dike has exhibited signs of weakened integrity. Isolated occurrences of excessive seepage and dangerous structurally erosive hydraulic piping resulting in visible surface boils on the exterior side of the dike have been located, monitored, and repaired. Extensive engineering analysis of the dike has resulted in the implementation of a water management plan that includes the avoidance of retaining surface waters at elevation 18.0 ft or above.

The piping and boiling events that have occurred, in combination with the engineering analysis that has been conducted, have prompted the initiation of the Herbert Hoover Dike Rehabilitation Project. That project is an ambitious plan to repair and rehabilitate the dike. The plan includes the goal of repairing the dike wherever weakened sections exist, and restoring the structural integrity of the entire Herbert Hoover Dike system to allow for safe water retention at design water surface elevations. Engineering design for structural repair of the dike includes the construction of an impermeable cutoff wall as a component of the rehabilitated dike sections. The cutoff wall will penetrate downward into the geologic structure underling the dike. The cutoff wall will affect the flow behavior of groundwater. The modeling investigation that is the subject of this Scope of Work (SOW) will seek to determine and quantify the extent of the effect on groundwater flow behavior associated with the introduction of the cutoff wall into the subsurface structure. The modeling investigation is an

important engineering exercise related to the successful implementation of rehabilitation for the dike.

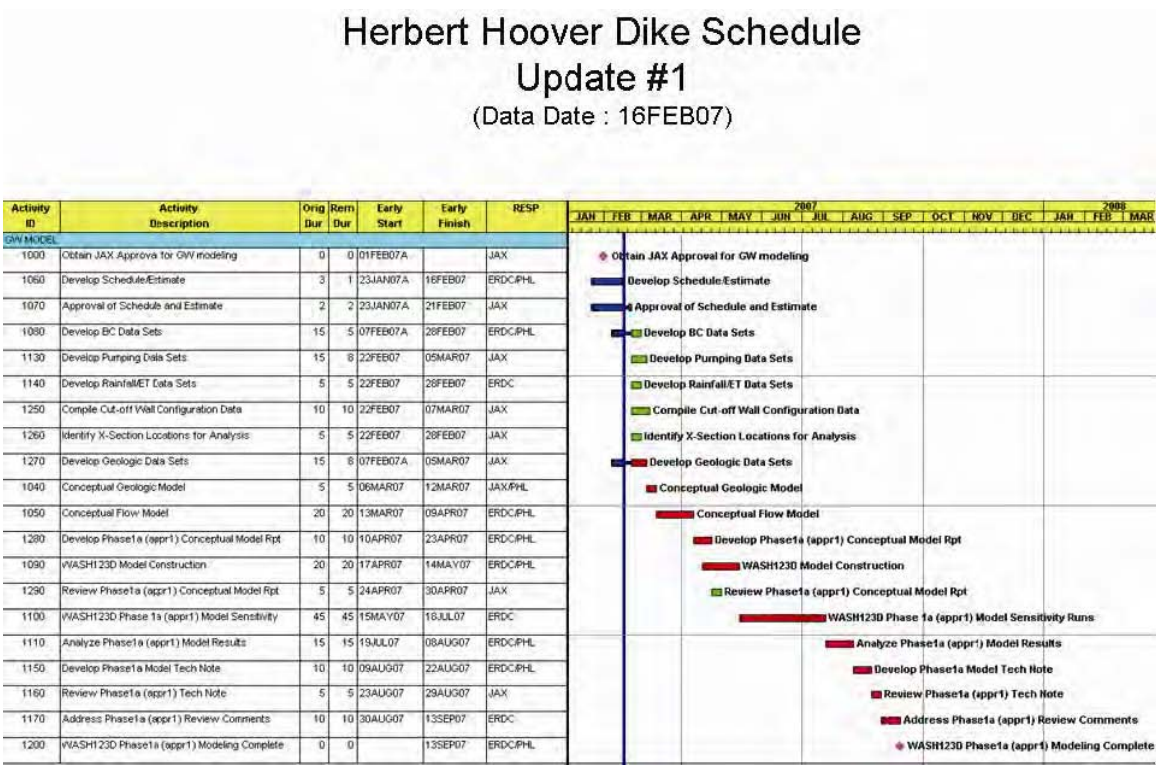
Modeling objective

The objective of the proposed modeling is to evaluate the effect of the proposed cutoff wall for the Herbert Hoover Dike on the regional groundwater regime by developing a Lake Okeechobee sub-regional groundwater numerical model. This modeling is proposed in two phases. The Phase 1 model will be used to estimate the changes of the groundwater levels and to compare computed pressure heads and groundwater flow at specified locations for runs with and without the designed cutoff wall configuration. Assumptions will be made concerning boundary conditions and other modeling aspects to fill data gaps. This will allow modeling to focus on with project versus without project differences related to the groundwater flow regime. As described in this SOW, the Phase 1 work is further divided into two sub-phases. The Phase 1A modeling will use a sensitivity analysis of steady state only 3-D simulations, to bracket assumptions and typical data ranges, while the Phase 1B modeling will use transient 3-D only simulations to model transitions in both Lake Okeechobee stages and groundwater flow. Both portions of the Phase 1 modeling are intended to evaluate the scale of the pressure head changes resulting from the cutoff wall. However, this SOW, schedule and cost estimate only relate to the Phase 1A modeling. The SOW for Phase 1B modeling will be developed if determined necessary based on Phase 1A results. Phase 2 modeling, if warranted based on Phase 1 model results, would be an integrated surface-subsurface flow model that would represent Lake Okeechobee as a surface water storage area which would respond to changes in net inflows and outflows. Phase 2 modeling is not considered in this SOW. If the decision is made at a later date to proceed with Phase 2, a new SOW will be prepared.

Proposed modeling effort

The purpose of the Phase 1A modeling effort is to develop and evaluate a Lake Okeechobee sub-regional groundwater numerical model, and evaluate the sub-regional groundwater changes associated with the introduction of the cutoff wall segments into the subsurface geologic structure underlying Herbert Hoover Dike, the containment levee system that defines the perimeter of Lake Okeechobee surface water storage. The model developed for this phase will be a 3-D variably saturated subsurface

flow representation. Comparison of existing condition (HHD without cutoff wall) and with-project condition (HHD with cutoff wall) resultant groundwater fluxes and exterior groundwater stages will indicate magnitude of cutoff wall impact. In lieu of a traditional model calibration/validation effort, representative material parameters will be used for the analyses with a series of sensitivity runs conducted to define the magnitude of the cutoff wall impacts. Steady-state analyses employing various system conditions (e.g., wet, dry, and average) will be used for the evaluation. The following tasks are required to complete the proposed modeling effort. The schedule for the proposed Phase 1A modeling is shown in Figure A1.



Activity ID	Activity Description	Orig Dur	Rem Dur	Early Start	Early Finish	RESP
GW MODEL						
1000	Obtain JAX Approva for GW modeling	0	0	01FEB07A		JAX
1060	Develop Schedule/Estimate	3	1	23JAN07A	16FEB07	ERDC/PHL
1070	Approval of Schedule and Estimate	2	2	23JAN07A	21FEB07	JAX
1080	Develop BC Data Sets	15	5	07FEB07A	28FEB07	ERDC/PHL
1130	Develop Pumping Data Sets	15	8	22FEB07	05MAR07	JAX
1140	Develop Rainfall/ET Data Sets	5	5	22FEB07	28FEB07	ERDC
1250	Compile Cut-off Wall Configuration Data	10	10	22FEB07	07MAR07	JAX
1260	Identify X-Section Locations for Analysis	5	5	22FEB07	28FEB07	JAX
1270	Develop Geologic Data Sets	15	8	07FEB07A	05MAR07	JAX
1040	Conceptual Geologic Model	5	5	06MAR07	12MAR07	JAX/PHL
1050	Conceptual Flow Model	20	20	13MAR07	09APR07	ERDC/PHL
1280	Develop Phase1a (appr1) Conceptual Model Rpt	10	10	10APR07	23APR07	ERDC/PHL
1090	WASH123D Model Construction	20	20	17APR07	14MAY07	ERDC/PHL
1290	Review Phase1a (appr1) Conceptual Model Rpt	5	5	24APR07	30APR07	JAX
1100	WASH123D Phase 1a (appr1) Model Sensitivity	45	45	15MAY07	18JUL07	ERDC
1110	Analyze Phase1a (appr1) Model Results	15	15	19JUL07	08AUG07	ERDC/PHL
1150	Develop Phase1a Model Tech Note	10	10	09AUG07	22AUG07	ERDC/PHL
1160	Review Phase1a (appr1) Tech Note	5	5	23AUG07	29AUG07	JAX
1170	Address Phase1a (appr1) Review Comments	10	10	30AUG07	13SEP07	ERDC
1200	WASH123D Phase1a (appr1) Modeling Complete	0	0		13SEP07	ERDC/PHL

Figure A1. HHD Phase 1A project schedule.

Conceptual geologic model

Based on the available data and input from the geologists in the Jacksonville District, a conceptual model of the site geology will be developed. This geologic conceptual model will be based on the Draft Hydro-geologic Framework Report for Regional Engineering Model for Ecosystem Restoration (Fies, et all, 2005), the geologic interpretation contained within the MIKE-SHE model of the EAA, and the Geotechnical Evaluations contained in the Major Rehabilitation Evaluation Reports for

the Herbert Hoover Dike. This geologic model will, at a minimum, define the contacts between the geologic units to be included in the WASH123D numerical model and provide a reasonable range of hydraulic conductivities for each geologic material. Construction of the geologic model will be a joint effort between ERDC and Jacksonville District.

ACTION: This task requires both SAJ and ERDC (NAP) and is scheduled to take a total of 20 d (Activities 1270 and 1040 in Figure A1).

Conceptual flow model

In conjunction with the conceptual geologic model, a conceptual flow model will be developed to identify known features that affect groundwater flow. These features include, but are not limited to regional flow patterns between recharge/discharge areas, lakes, canals, cutoff wall details, and groundwater pumping within and surrounding the model domain. Data related to lake, canal and groundwater stage has been collected in support of other modeling efforts performed to date. This data will be reviewed in order to develop adequate boundary conditions for the WASH123D model. Only limited data has been collected to date for the groundwater pumping in the area. ERDC will work with Jacksonville District personnel to determine appropriate groundwater pumping scenarios for the Phase 1A sensitivity simulations. Jacksonville District will also provide location, depth, and constructions details related to the cutoff wall sections to be modeled. All the data needed for this model development is shown in Table A1. The parameters for the sensitivity model runs to be conducted in the project will be identified based on the preliminary test run results when the conceptual flow model is available. A total of 60 model runs for the sensitivity analyses are to be scheduled in this task. The descriptions of these model runs will be documented in the conceptual model report. If during the course of the Phase 1A work, Jacksonville District and ERDC determine that significant additional sensitivity simulations are required, an addendum to this SOW with changes to the cost estimate and schedule will be developed.

ACTION: This task will be accomplished mainly by ERDC and NAP with input and data being supplied by SAJ. The activities on the schedule for this task are Activities 1080, 1130, 1140, 1250, 1260, 1050, and 1280 as shown in Figure A1 and will require about 50 days total time.

Table A1. Needed data matrices for HHD Phase 1 groundwater model.

Data Type	Usage	Current Status of Data
Topography	* Define ground surface boundary of the model	Data was collected and processed for the SWWRP demo model
Hydro-geology	* Define bottom boundary of the domain * Assign material type and the associated hydraulic conductivity value for each element in the computational mesh * Hydraulic conductivity ranges will be evaluated in the sensitivity analyses	To be provided by Jacksonville (expected to be consistent with that in the MIKE-SHE model and in the SAJ Hydro-geologic Framework Report, 2005)
Lake Okeechobee stages	* Set up head boundary conditions on the lake side of the model	Data was collected for the SWWRP demo model
Stages of canals included in the modeling domain	* Set up enforced head boundary conditions on the ground surface boundary on the land side of the model	Some data was collected for the SWWRP demo model - additional collection and processing will be required by ERDC
Groundwater heads	* Set up head boundary conditions on the land side of the model	Some data was collected for the SWWRP demo model - additional collection and processing will be required by ERDC
Rainfall & ET data	* Set up variable boundary conditions on the ground surface boundary on the land side of the domain	Some data was collected for the SWWRP demo model - additional collection and processing will be required by ERDC
Pumping data	* Set up source/sink conditions in the model	Limited data collected to date - to be provided by Jacksonville
Cutoff wall locations & specifications	* Incorporate cutoff wall (at least two-element thick in all directions) into the model	To be provided by Jacksonville
X-section locations & specifications	* Compare groundwater flows between w/ and w/o cutoff wall in post-processing	To be provided by Jacksonville

Model domain and approach

Initially, the WASH123D model domain will extend southward to EAA Bolles and Cross Canal and radially approximately 5-10 miles outward from HHD to near "red-dotted" line as shown in HHD Rehabilitation Project Map provided in scope of work (Figure A2 below). The Phase 1 modeling will be performed in a 3-D only mode to address concerns related to subsurface flow patterns. Two approaches were proposed for Phase 1 modeling in this document.

Approach 1 models Priority Areas 1 through 3 as indicated in Figure A2. The Approach 1 model will also extend radially approximately 0.5-1 mile inward from HHD (red solid line in Figure A2). Figure A3 shows a general model X-section perpendicular to HHD (e.g., AA' in Figure A2). Approach 1 was selected by Jacksonville District.

Approach 2 is a subsurface model of a larger domain. Appendix B more fully describes the purpose and limitations of each modeling approach and are included for completeness. If issues arise with the development of the Approach 1 model, Jacksonville District and ERDC will jointly determine if a shift to modeling Approach 2 is appropriate.

ACTION: The development of the final model domain will be made as part of Activity 1050 in Figure A1. A preliminary model domain is shown in Figure A4.

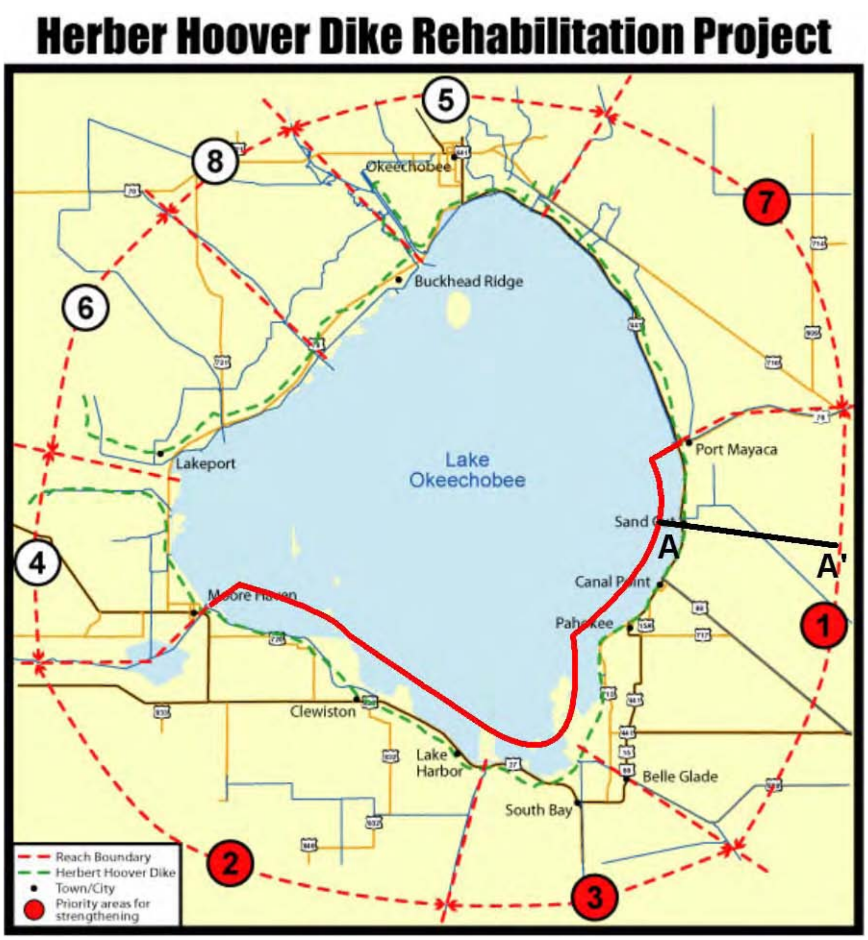


Figure A2. HHD Phase 1 groundwater model domain (including Priority Areas 1 through 3 and extend radially approximately 0.5-1 mile inward from HHD, Approach 1).

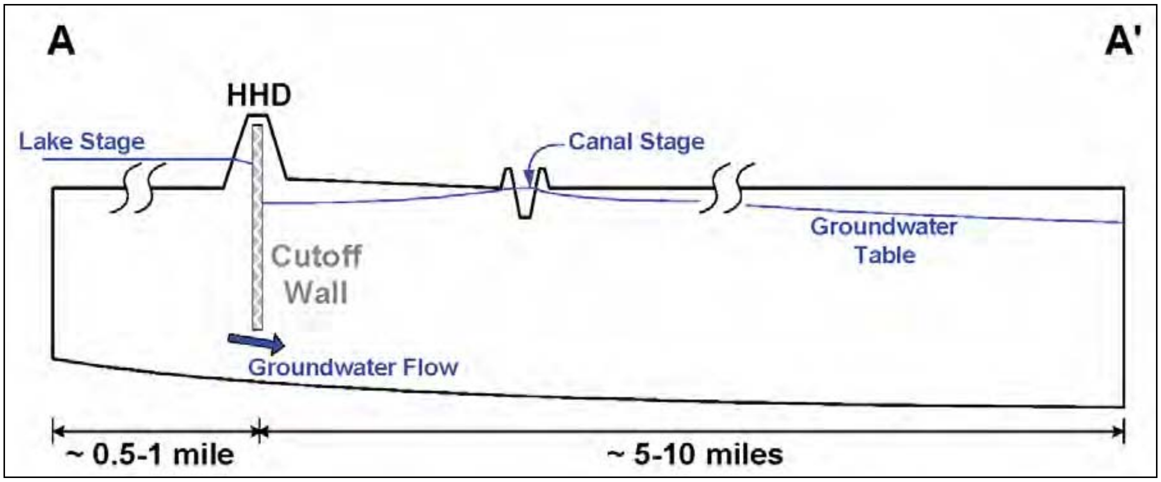


Figure A3. A typical X-section in the HHD Phase 1 groundwater model (Approach 1).

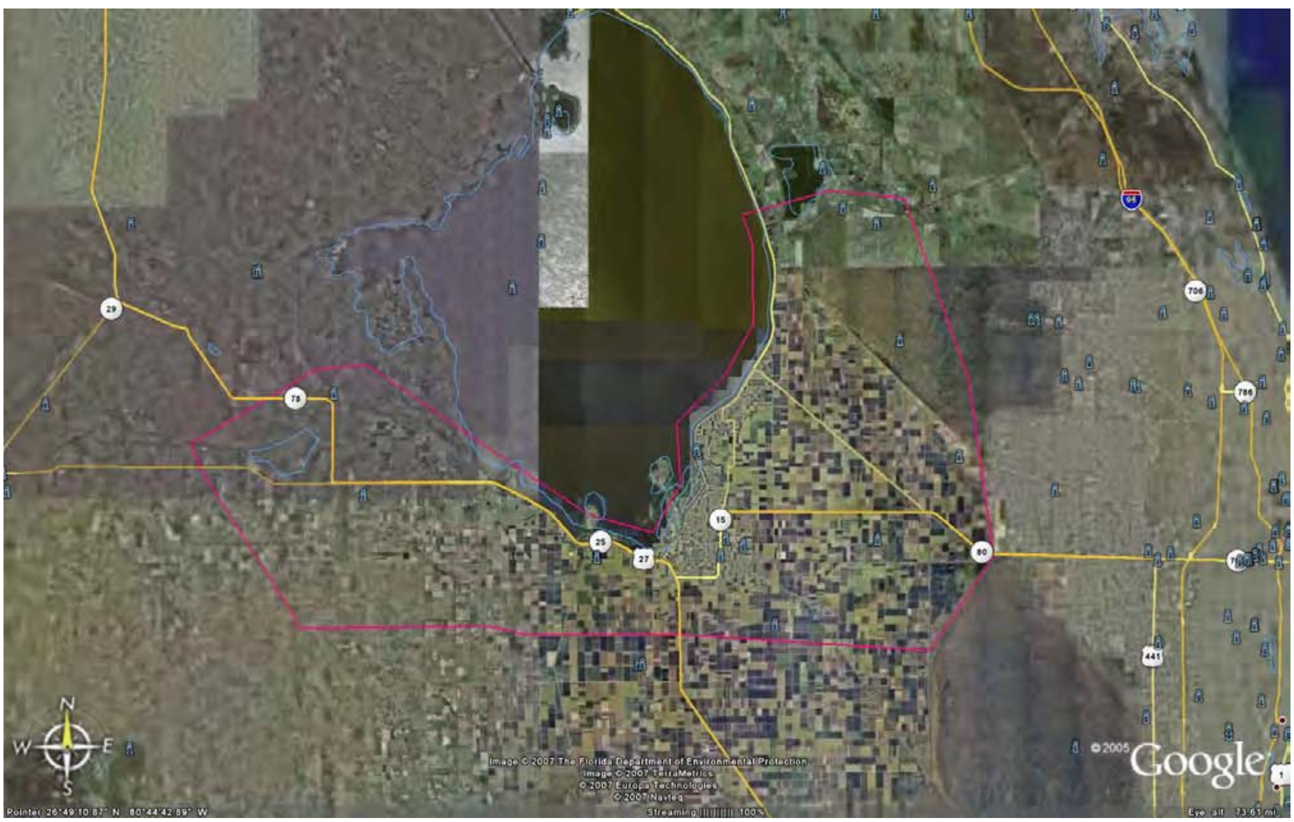


Figure A4. Preliminary model domain (domain boundary is highlighted in red) for HHD Approach 1 model.

Model simulations and post-processing

The Phase 1A modeling will include sensitivity analyses on key model parameters and perform steady-state simulations only. The Lake Okeechobee stages, the canal stages, the groundwater heads, rainfall and evapotranspiration field data from the SFWMM record will be compiled and applied to the model to set up system conditions for computer simulation, while the bottom boundary face of the model is assumed a no-flow boundary (top of Hawthorn Group). Various system conditions representing wet, average, and dry hydro-meteorological conditions will be chosen based on the given field data. The key model parameters to consider for sensitivity analyses, such as the hydraulic conductivities of subsurface materials, Lake Okeechobee bed conductance, and the conductivity of the cutoff wall, will be identified when the preliminary test run results are available. The goal of this Phase 1A steady-state modeling would be to indicate the magnitude of impact a cutoff wall would have on the regional groundwater flow. As such, sensitivity analyses will be performed in lieu of a typical model calibration.

To determine the effectiveness of cutoff wall in reducing the groundwater flow, the results from the with and without cutoff wall model runs will be compared at the X-sections of interest defined by the Jacksonville District. The head contours also can be plotted for comparison as needed.

ACTION: This task would be done mainly by ERDC with some assistance from NAP and includes Activities 1090, 1100, and 1110 in Figure A1 and requires about 80 days to complete.

Reporting

ERDC will develop reports and PowerPoint presentations for this effort detailing the modeling progress, results, and recommendations. It is anticipated that an interim letter report will be developed describing the data collection, conceptual model development effort, and model runs to be conducted. This letter report will detail the Phase 1A model configuration, adopted modeling approach, and assumptions to be incorporated into the WASH123D model. Upon completion of the Phase 1A modeling, the results of the steady-state sensitivity analyses will be summarized in a Technical Note. This Technical Note will detail model construction, results, and recommendations. A similar reporting process would be included if the Phase 1B and Phase 2 models are required.

ACTION: This task would be completed by ERDC, i.e., Activity 1150 in Figure A1, and will require about 10 days to complete.

Scheduling and cost

The effort proposed in this document will be undertaken by a team consisting of ERDC and NAP engineers and scientists. The detailed schedule for the Phase 1A work is included in Figure A1. The costs and P2 resourcing to complete this work are given in Table A2. The ERDC POC for this work is Dr. Pearce Cheng who can be reached by phone at 601-634-3699, by fax at 601-634-4208, and by e-mail at hwai-ping.cheng@erdc.usace.army.mil.

Special notes

Upon completion of the Phase 1A steady-state sensitivity simulations, transient simulations may be performed but would require a change to add these tasks to this SOW. If this modeling is performed, it would provide a better understanding of how the system responds to transient stresses under with and without project conditions. This Phase 1B transient modeling would only be undertaken if adequate time series data is available, the results of the Phase 1A modeling show the need for this type of modeling, and this modeling is requested by Jacksonville District. If the decision is made at a later date to proceed with Phase 1B, a new or modified SOW with the cost estimate and schedule will be prepared.

Because the Phase 1 modeling will be performed by using a 3-D subsurface flow only model, the relative impacts to surface flow will not be evaluated. Consequently, questions related to the rise in the Lake Okeechobee stage in response to cutoff wall construction would not be addressed in the Phase 1 modeling. A Phase 2 modeling effort could be performed to address questions related to the impacts of a cutoff wall on surface water levels. This Phase 2 modeling effort, if warranted, would use a transient model accounting for a coupled system of 1-D canal networks, 2-D overland regimes, and 3-D subsurface media. This model would allow the lake and canal stages to dynamically fluctuate in response to various system stresses such as rainfall; as well as, with or without project conditions. This Phase 2 modeling would only be undertaken if adequate time series data is available to define surface and subsurface conditions, if the results of the Phase 1 modeling show the need for this type of modeling, and this modeling is requested by Jacksonville District. If the decision is made at a later date to proceed with Phase 2, a new SOW, cost estimate and schedule will be prepared.

Table A2. Cost for completing the Phase 1A modeling work.

Activity ID	Activity description	Duration (d)	Budgeted Hours
1000	Obtain JAX Approval for GW modeling	0	0
1060	Develop Schedule/Estimate	3	48
1070	Approval of Schedule and Estimate	0	0
1140	Develop Rainfall/ET Data Sets	5	64
1260	Identify X-Section Locations for Analysis	0	0
1250	Compile Cutoff Wall Configuration Data	0	0
1080	Develop BC Data Sets	15	120
1130	Develop Pumping Data Sets	2	16
1270	Develop Geologic Data Sets	2	16
1040	Conceptual Geologic Model	5	16
1050	Conceptual Flow Model	20	160
1280	Develop Phase 1A (Appr 1) Conceptual Model Rpt	10	120
1290	Review Phase 1A (Appr 1) Conceptual Model Rpt	0	0
1090	WASH123D Model Construction	20	176
1100	WASH123D Phase 1A (Appr 1) Model Sensitivity Runs	45	412
1110	Analyze Phase 1A (Appr 1) Model Results	15	128
1150	Develop Phase 1A Model Tech Note	10	96
1160	Review Phase 1A (Appr 1) Tech Note	0	0
1170	Address Phase 1A (Appr 1) Review Comments	10	136
1200	WASH123D Phase 1A (Appr 1) Modeling Complete	0	0
Total budgeted Hours			1508
Total Labor			$201,000
Travel			$10,000
Project Total			$211,000
P2 Resourcing		**Amount**	
E5L0720 labor		$38,100	
E5L0000 travel		$5,000	
U430510 labor		$162,900	
U430000 travel		$3,060	
U430000 othfacserv		$1,940	

Appendix B. HHD Modeling Approach 2

Approach 2 accounts for an area covering all priority areas and Lake Okeechobee as well, i.e., the area enclosed by the red solid line in Figure B1. Figure B2 depicts a general model X-section across Lake Okeechobee (e.g., BB' in Figure B1). In the WASH123D Demo Project sponsored by the ERDC SWWRP in FY06, it was revealed that the hydro-static assumption may not be valid around Lake Okeechobee (Figures B3 through B6). Consequently, the boundary conditions used in the model may vary with depth along the model boundary. As described below, each approach will be capable of simulating different effects on regional groundwater flow. The selected modeling approach must address the engineering issues defined by Jacksonville District in an expeditious and cost effective manner.

Model Approach 1

What the model WILL do?

1. Simulate changes to the region flow patterns resulting from cutoff wall at reaches 1, 2, and 3, only.
2. Simulate the effects of stage variations in the canals immediately downstream of reaches 1, 2, and 3 on the region flow patterns. Stage variation sensitivities will be performed through 3-D boundary condition assignment, not 1-D channel routing.

What the model WILL NOT do?

1. Simulate the impacts to surface water bodies (lakes, canals, etc.) resulting from cutoff wall construction.
2. Simulate the transient stresses on the region flow regime.
3. Simulate regional flow impacts of cutoff walls located in reaches 4, 5, 6, 7, and 8, potentially skewing the computed flow patterns for reaches 1, 2, and 3.
4. Simulate regional flow from the highlands area northwest of Lake Okeechobee to the EAA in the southeast in a discernable manner.
5. Address the effect of lake bed conductance and lake stage variation on the regional flow regime.

Model Approach 2

What the model WILL do?

1. Simulate changes to the region flow patterns resulting from cutoff walls surrounding Lake Okeechobee.
2. Simulate the effects of stage variations in the canals surrounding Lake Okeechobee on the region flow patterns. Stage variation sensitivities will be performed through 3-D boundary condition assignment, not 1-D channel routing.
3. Address the effect of the proposed cutoff wall for reaches 1, 2, 3, 4, 5, 6, 7, and 8 on the regional flow regime.
4. Simulate component of regional flow from the highlands area northwest of Lake Okeechobee to the EAA in the southeast
5. Address the effect of lake bed conductance on regional flow regime.

What the model WILL NOT do?

1. Simulate the impacts to surface water bodies (lakes, canals, etc.) resulting from cutoff wall construction.
2. Simulate the transient stresses on the region flow regime.

Overall, the Approach 2 model will be approximately 2.5 times larger than Approach 1. This increase in size will increase model development and simulation time. Based on experience with similar sized regional flow models (3-D only), the anticipated runtime for a steady-state model will be approximately 16 minutes for Approach 1 and 40 minutes for Approach 2. These runtimes assume the use of a typical desktop computer. Use of the available resources in the High Performance Computing Center (HPCC) or on the Jacksonville District WOPR cluster may significantly improve model runtime.

Although the modeling defined in Approach 2 will take marginally more effort to construct, it will be capable of evaluating a wider range of questions related to the proposed cutoff wall.

Figure B1. HHD Phase 1 groundwater model domain (including all priority areas as well as Lake Okeechobee, Approach 2).

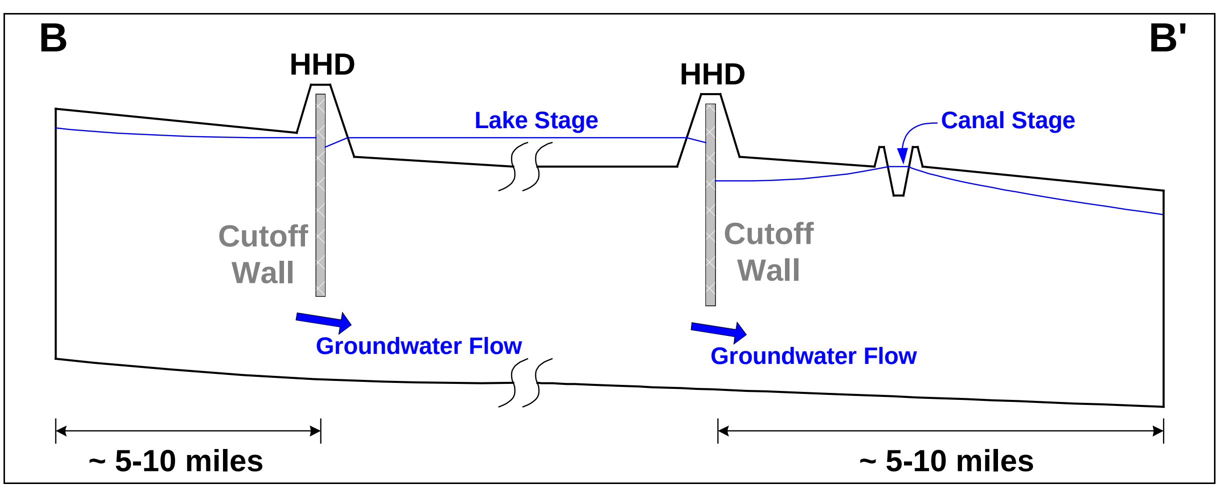


Figure B2. A typical X-section in the HHD Phase 1 groundwater model (Approach 2).

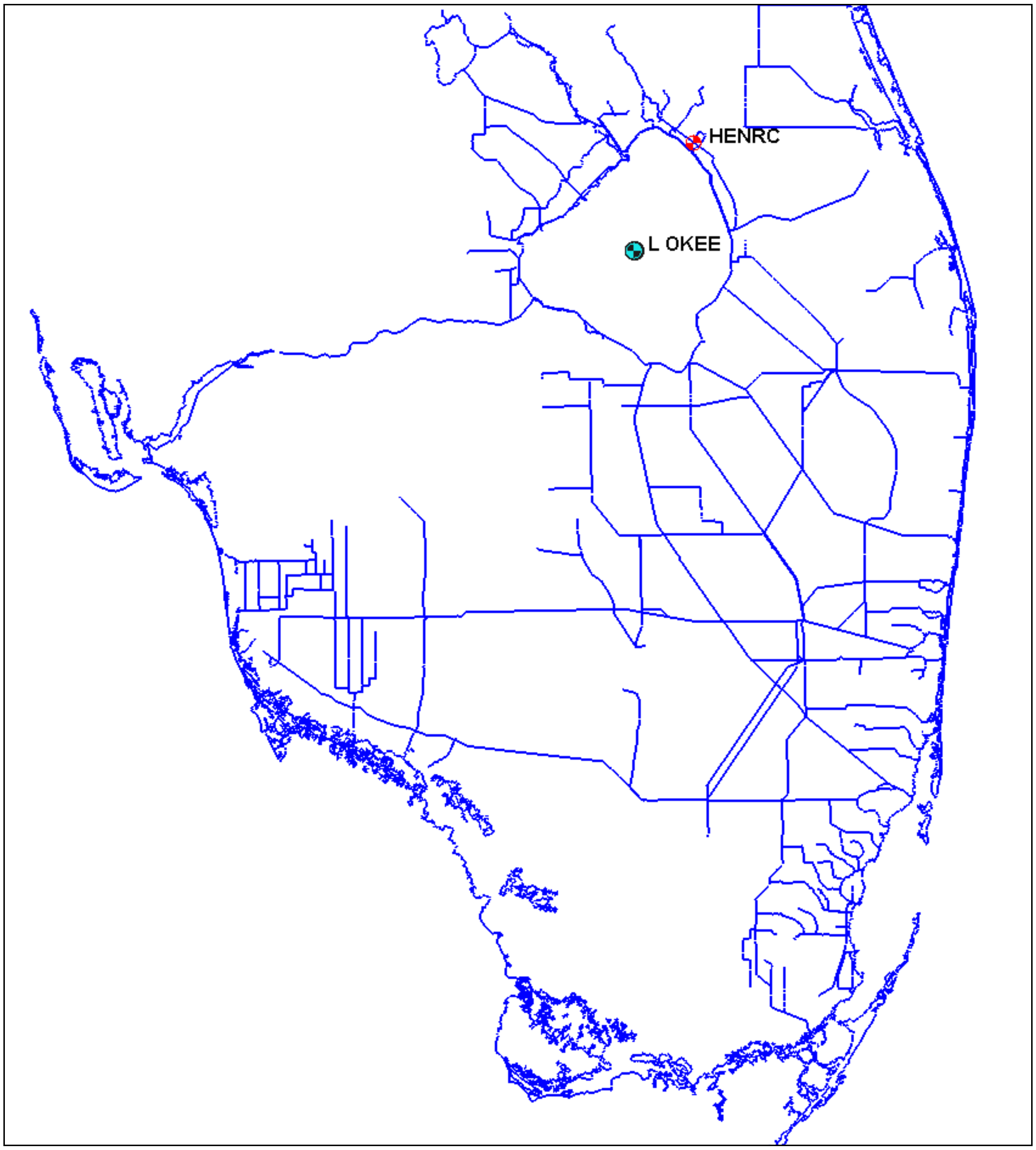
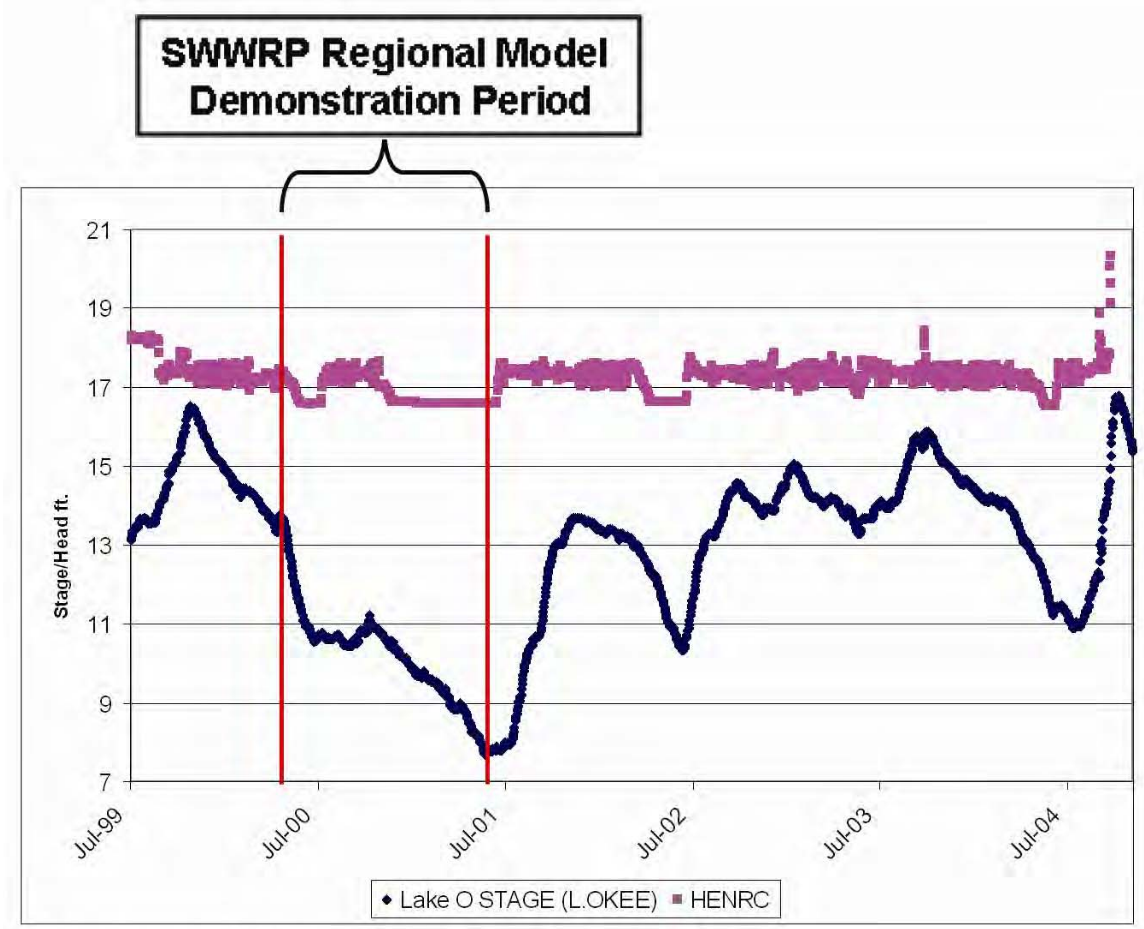


Figure B3. Locations of Lake Okeechobee and the HENRC Surface Water Gage.



Note: Data from DBHydro database
Vertical Datum in NAVD88

Figure B4. Lake Okeechobee and HENRC Surface Water Gage Data.

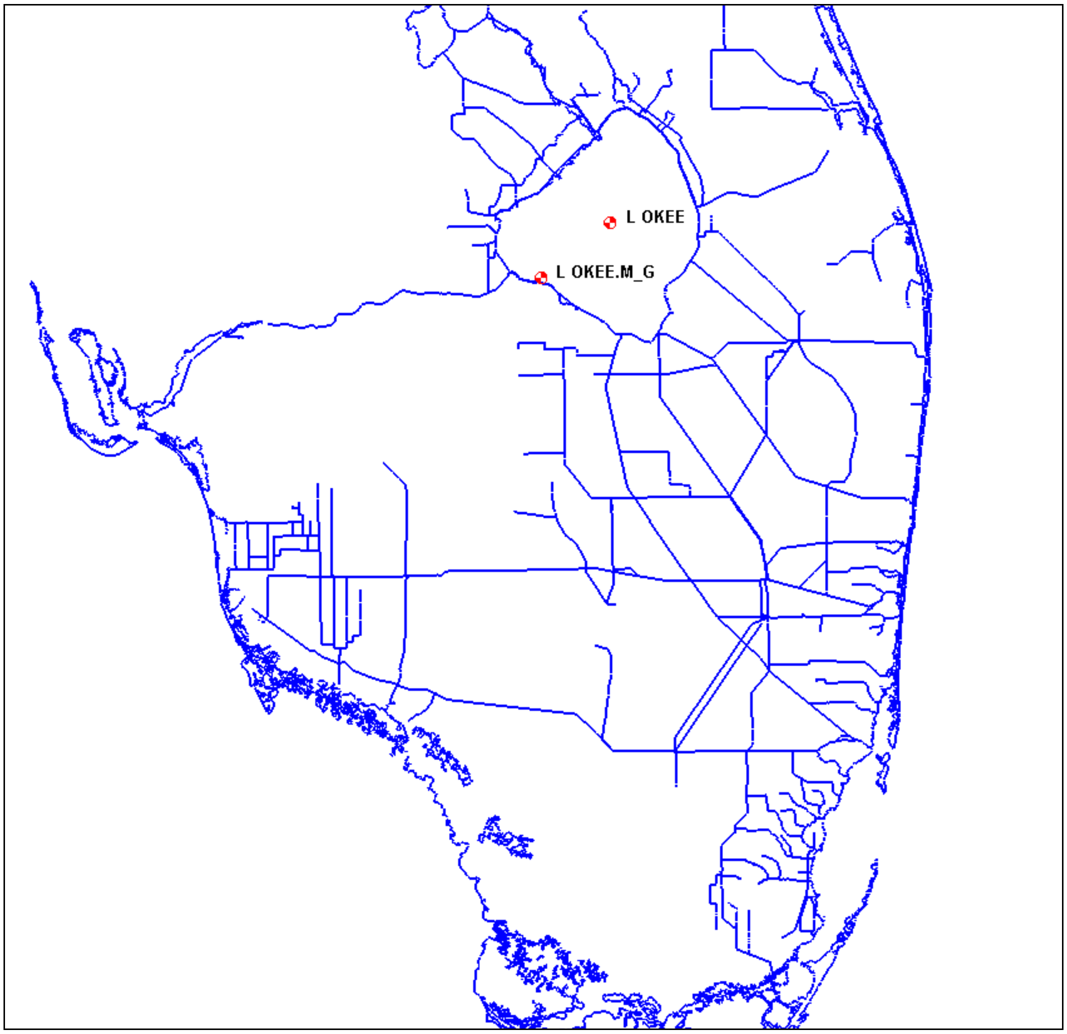
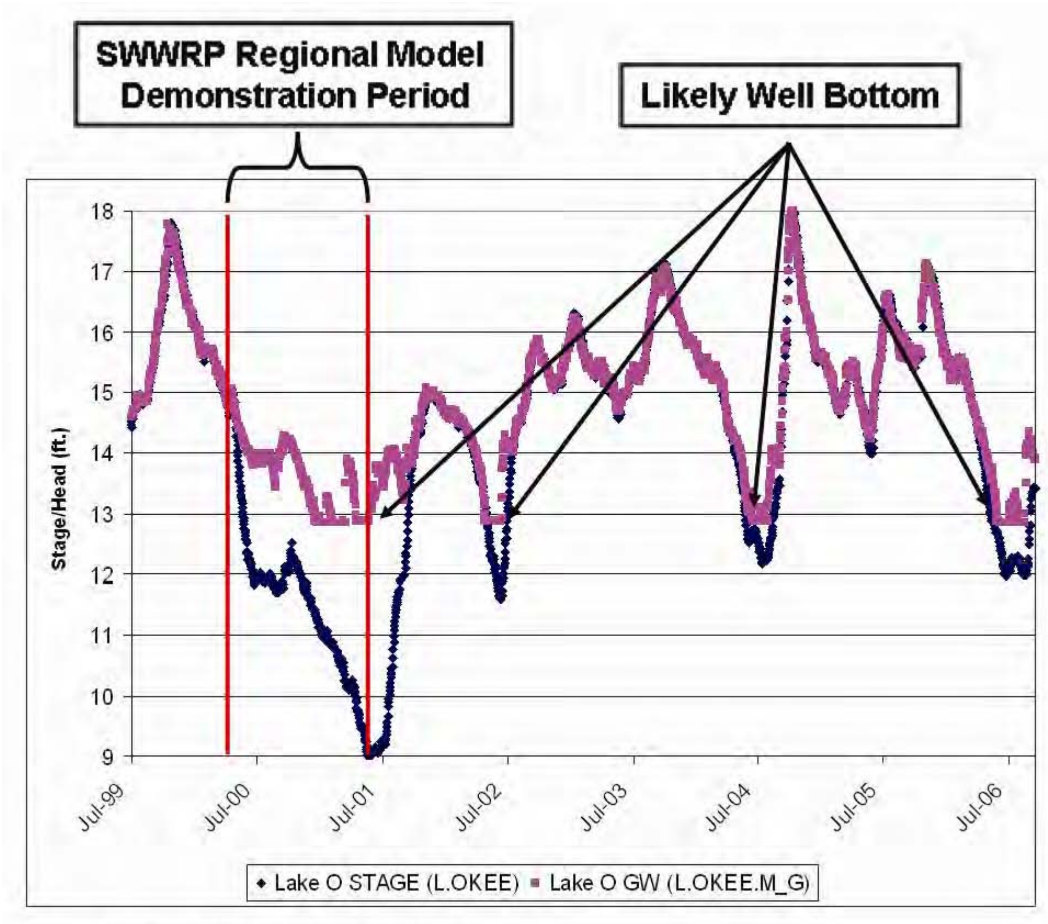


Figure B5. Lake Okeechobee Groundwater and Lake Stage Gage Locations.



Note: Raw data from DBHydro database
Vertical Datum in NGVD29 (not NAVD88)

Figure B6. Groundwater Head and Lake Stage at Lake Okeechobee.

Appendix C. Tables and Figures of Stage 1 Results of HHD Phase 1A model

There are 67 tables (Tables C1 through C67) and 25 figures (Figures C1 through C25) included in this appendix to show the Stage 1 results of HHD Phase 1A model.

Table C1. Cross-sectional groundwater flow comparison between Runs 2 and 1 in Stage 1.

w/o project					
X-section ID	Description	Run 1, Base Case, cfd	Run 2, K_L1-Max**, cfd	Difference Run2-Run1, cfd	Unit Difference*** (Run2-Run1)/L, cfd/ft
1-1	50 ft from HHD	213317	215639	2322	0.0066
1-2	100 ft from HHD	223694	225908	2214	0.0063
1-3	200 ft from HHD	248059	249484	1425	0.0041
1-4	500 ft from HHD	250382	250915	532	0.0015
1-5	1000 ft from HHD	219210	218565	-645	-0.0018
1-6	5000 ft from HHD	157356	156383	-973	-0.0028
1-7	10,000 ft HHD	99515	98637	-878	-0.0025
Reach 1 Avg. Abs. Diff.*				1284	0.0037
2-1	50 ft from HHD	82590	81745	-845	-0.0078
2-2	100 ft from HHD	106002	105640	-362	-0.0033
2-3	200 ft from HHD	120240	120454	214	0.0020
2-4	500 ft from HHD	132027	132880	853	0.0079
2-5	1000 ft from HHD	170962	171817	855	0.0079
2-6	5000 ft from HHD	69312	70064	751	0.0069
2-7	10,000 ft HHD	52565	53766	1201	0.0111
Reach 2 Avg. Abs. Diff.				726	0.0067
3-1	50 ft from HHD	35268	36336	1068	0.0308
3-2	100 ft from HHD	46262	47363	1102	0.0318
3-3	200 ft from HHD	50507	51777	1270	0.0366
3-4	500 ft from HHD	79807	80709	902	0.0260
3-5	1000 ft from HHD	109226	108899	-328	-0.0094
3-6	5000 ft from HHD	76290	75140	-1150	-0.0332
3-7	10,000 ft HHD	81783	79239	-2543	-0.0733
Reach 3 Avg. Abs. Diff.				1195	0.0345
Overall Avg. Abs. Diff.		374910	375908	3205	0.0065

cfd = cubic feet per day.

* Avg. Abs. Diff. = Averaged Absolute Flow Rate Difference.

** The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

*** Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table C2. Cross-sectional groundwater flow comparison between Runs 3 and 1 in Stage 1.

w/o project					
X-section ID	Description	Run 1, Base Case, cfd	Run 3, K_L1-Min**, cfd	Difference Run3-Run1, cfd	Unit Difference*** (Run3-Run1)/L, cfd/ft
1-1	50 ft from HHD	213317	207311	-6006	-0.0172
1-2	100 ft from HHD	223694	218355	-5339	-0.0153
1-3	200 ft from HHD	248059	246522	-1537	-0.0044
1-4	500 ft from HHD	250382	252888	2506	0.0072
1-5	1000 ft from HHD	219210	223772	4561	0.0130
1-6	5000 ft from HHD	157356	162185	4828	0.0138
1-7	10,000 ft HHD	99515	103677	4162	0.0119
Reach 1 Avg. Abs. Diff.*				4134	0.0118
2-1	50 ft from HHD	82590	88247	5657	0.0522
2-2	100 ft from HHD	106002	110171	4170	0.0385
2-3	200 ft from HHD	120240	122140	1900	0.0175
2-4	500 ft from HHD	132027	130762	-1265	-0.0117
2-5	1000 ft from HHD	170962	168706	-2255	-0.0208
2-6	5000 ft from HHD	69312	67518	-1795	-0.0166
2-7	10,000 ft HHD	52565	47866	-4699	-0.0434
Reach 2 Avg. Abs. Diff.				3106	0.0287
3-1	50 ft from HHD	35268	32454	-2815	-0.0812
3-2	100 ft from HHD	46262	42517	-3745	-0.1080
3-3	200 ft from HHD	50507	45360	-5146	-0.1484
3-4	500 ft from HHD	79807	74681	-5125	-0.1478
3-5	1000 ft from HHD	109226	108162	-1064	-0.0307
3-6	5000 ft from HHD	76290	78471	2180	0.0629
3-7	10,000 ft HHD	81783	88763	6981	0.2013
Reach 3 Avg. Abs. Diff.				3865	0.1115
Overall Avg. Abs. Diff.		374910	374361	11105	0.0225

cfd = cubic feet per day.

* Avg. Abs. Diff. = Averaged Absolute Flow Rate Difference.

** The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

*** Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table C3. Cross-sectional groundwater flow comparison between Runs 4 and 1 in Stage 1.

w/o project					
X-section ID	Description	Run 1, Base Case, cfd	Run 4, K_L21-Max**, cfd	Difference Run4-Run1, cfd	Unit Difference*** (Run4-Run1)/L, cfd/ft
1-1	50 ft from HHD	213317	245401	32085	0.0917
1-2	100 ft from HHD	223694	256583	32889	0.0940
1-3	200 ft from HHD	248059	279896	31837	0.0910
1-4	500 ft from HHD	250382	278096	27713	0.0792
1-5	1000 ft from HHD	219210	236798	17587	0.0503
1-6	5000 ft from HHD	157356	163579	6223	0.0178
1-7	10,000 ft HHD	99515	102026	2511	0.0072
Reach 1 Avg. Abs. Diff.*				21549	0.0616
2-1	50 ft from HHD	82590	86512	3922	0.0362
2-2	100 ft from HHD	106002	115286	9285	0.0857
2-3	200 ft from HHD	120240	133674	13433	0.1240
2-4	500 ft from HHD	132027	149837	17810	0.1644
2-5	1000 ft from HHD	170962	192899	21937	0.2025
2-6	5000 ft from HHD	69312	80230	10918	0.1008
2-7	10,000 ft HHD	52565	63282	10717	0.0989
Reach 2 Avg. Abs. Diff.				12575	0.1161
3-1	50 ft from HHD	35268	43034	7765	0.2239
3-2	100 ft from HHD	46262	56673	10411	0.3002
3-3	200 ft from HHD	50507	61793	11287	0.3255
3-4	500 ft from HHD	79807	91648	11841	0.3415
3-5	1000 ft from HHD	109226	111899	2673	0.0771
3-6	5000 ft from HHD	76290	71239	-5052	-0.1457
3-7	10,000 ft HHD	81783	66928	-14855	-0.4284
Reach 3 Avg. Abs. Diff.				9126	0.2632
Overall Avg. Abs. Diff.		374910	412473	43250	0.0878

cfd = cubic feet per day.

* Avg. Abs. Diff. = Averaged Absolute Flow Rate Difference.

** The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

*** Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table C4. Cross-sectional groundwater flow comparison between Runs 5 and 1 in Stage 1.

w/o project					
X-section ID	Description	Run 1, Base Case, cfd	Run 5, K_L21-Min**, cfd	Difference Run5-Run1, cfd	Unit Difference*** (Run5-Run1)/L, cfd/ft
1-1	50 ft from HHD	213317	176624	-36693	-0.1049
1-2	100 ft from HHD	223694	186196	-37497	-0.1072
1-3	200 ft from HHD	248059	211176	-36882	-0.1054
1-4	500 ft from HHD	250382	216608	-33774	-0.0966
1-5	1000 ft from HHD	219210	193395	-25815	-0.0738
1-6	5000 ft from HHD	157356	142803	-14554	-0.0416
1-7	10,000 ft HHD	99515	92109	-7406	-0.0212
Reach 1 Avg. Abs. Diff.*				27517	0.0787
2-1	50 ft from HHD	82590	77044	-5545	-0.0512
2-2	100 ft from HHD	106002	95695	-10307	-0.0951
2-3	200 ft from HHD	120240	105251	-14990	-0.1384
2-4	500 ft from HHD	132027	111464	-20563	-0.1898
2-5	1000 ft from HHD	170962	142394	-28568	-0.2637
2-6	5000 ft from HHD	69312	57906	-11407	-0.1053
2-7	10,000 ft HHD	52565	41641	-10923	-0.1008
Reach 2 Avg. Abs. Diff.				14615	0.1349
3-1	50 ft from HHD	35268	27968	-7300	-0.2105
3-2	100 ft from HHD	46262	35721	-10541	-0.3040
3-3	200 ft from HHD	50507	37191	-13316	-0.3840
3-4	500 ft from HHD	79807	61001	-18806	-0.5424
3-5	1000 ft from HHD	109226	95104	-14123	-0.4073
3-6	5000 ft from HHD	76290	69709	-6582	-0.1898
3-7	10,000 ft HHD	81783	84258	2475	0.0714
Reach 3 Avg. Abs. Diff.				10449	0.3013
Overall Avg. Abs. Diff.		374910	323037	52581	0.1067

cfd = cubic feet per day.

* Avg. Abs. Diff. = Averaged Absolute Flow Rate Difference.

** The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

*** Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table C5. Cross-sectional groundwater flow comparison between Runs 6 and 1 in Stage 1.

w/o project					
X-section ID	Description	Run 1, Base Case, cfd	Run 6, K_L22-Max**, cfd	Difference Run6-Run1, cfd	Unit Difference*** (Run6-Run1)/L, cfd/ft
1-1	50 ft from HHD	213317	213352	35	0.0001
1-2	100 ft from HHD	223694	223757	63	0.0002
1-3	200 ft from HHD	248059	248237	179	0.0005
1-4	500 ft from HHD	250382	252320	1938	0.0055
1-5	1000 ft from HHD	219210	226460	7249	0.0207
1-6	5000 ft from HHD	157356	157534	177	0.0005
1-7	10,000 ft HHD	99515	99633	118	0.0003
Reach 1 Avg. Abs. Diff.*				1394	0.0040
2-1	50 ft from HHD	82590	89891	7301	0.0674
2-2	100 ft from HHD	106002	113511	7509	0.0693
2-3	200 ft from HHD	120240	128122	7882	0.0727
2-4	500 ft from HHD	132027	140427	8400	0.0775
2-5	1000 ft from HHD	170962	179777	8815	0.0814
2-6	5000 ft from HHD	69312	77071	7759	0.0716
2-7	10,000 ft HHD	52565	58564	5999	0.0554
Reach 2 Avg. Abs. Diff.				7666	0.0708
3-1	50 ft from HHD	35268	35682	414	0.0119
3-2	100 ft from HHD	46262	46924	662	0.0191
3-3	200 ft from HHD	50507	51548	1042	0.0300
3-4	500 ft from HHD	79807	80998	1191	0.0344
3-5	1000 ft from HHD	109226	110478	1252	0.0361
3-6	5000 ft from HHD	76290	76983	692	0.0200
3-7	10,000 ft HHD	81783	82113	330	0.0095
Reach 3 Avg. Abs. Diff.				798	0.0230
Overall Avg. Abs. Diff.		374910	384769	9858	0.0200

cfd = cubic feet per day.

* Avg. Abs. Diff. = Averaged Absolute Flow Rate Difference.

** The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

*** Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table C6. Cross-sectional groundwater flow comparison between Runs 7 and 1 in Stage 1.

w/o project					
X-section ID	Description	Run 1, Base Case, cfd	Run 7, K_L22-Min**, cfd	Difference Run7-Run1, cfd	Unit Difference*** (Run7-Run1)/L, cfd/ft
1-1	50 ft from HHD	213317	213567	250	0.0007
1-2	100 ft from HHD	223694	224543	849	0.0024
1-3	200 ft from HHD	248059	251140	3082	0.0088
1-4	500 ft from HHD	250382	255725	5342	0.0153
1-5	1000 ft from HHD	219210	222624	3414	0.0098
1-6	5000 ft from HHD	157356	160443	3086	0.0088
1-7	10,000 ft HHD	99515	102019	2504	0.0072
Reach 1 Avg. Abs. Diff.*				2647	0.0076
2-1	50 ft from HHD	82590	85867	3277	0.0302
2-2	100 ft from HHD	106002	108718	2716	0.0251
2-3	200 ft from HHD	120240	121652	1412	0.0130
2-4	500 ft from HHD	132027	131364	-663	-0.0061
2-5	1000 ft from HHD	170962	169919	-1042	-0.0096
2-6	5000 ft from HHD	69312	67839	-1473	-0.0136
2-7	10,000 ft HHD	52565	48831	-3733	-0.0345
Reach 2 Avg. Abs. Diff.				2045	0.0189
3-1	50 ft from HHD	35268	34201	-1067	-0.0308
3-2	100 ft from HHD	46262	44523	-1739	-0.0501
3-3	200 ft from HHD	50507	47716	-2791	-0.0805
3-4	500 ft from HHD	79807	77140	-2666	-0.0769
3-5	1000 ft from HHD	109226	108837	-390	-0.0112
3-6	5000 ft from HHD	76290	77404	1114	0.0321
3-7	10,000 ft HHD	81783	83328	1545	0.0446
Reach 3 Avg. Abs. Diff.				1616	0.0466
Overall Avg. Abs. Diff.		374910	376772	6308	0.0128

cfd = cubic feet per day.

* Avg. Abs. Diff. = Averaged Absolute Flow Rate Difference.

** The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

*** Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table C7. Cross-sectional groundwater flow comparison between Runs 8 and 1 in Stage 1.

w/o project					
X-section ID	Description	Run 1, Base Case, cfd	Run 8, K_L3A-Max**, cfd	Difference Run8-Run1, cfd	Unit Difference*** (Run8-Run1)/L, cfd/ft
1-1	50 ft from HHD	213317	264428	51111	0.1461
1-2	100 ft from HHD	223694	278210	54516	0.1558
1-3	200 ft from HHD	248059	313899	65841	0.1882
1-4	500 ft from HHD	250382	319830	69447	0.1985
1-5	1000 ft from HHD	219210	285070	65860	0.1883
1-6	5000 ft from HHD	157356	203051	45695	0.1306
1-7	10,000 ft HHD	99515	129572	30057	0.0859
Reach 1 Avg. Abs. Diff.*				54647	0.1562
2-1	50 ft from HHD	82590	111981	29391	0.2713
2-2	100 ft from HHD	106002	143979	37977	0.3505
2-3	200 ft from HHD	120240	164027	43787	0.4042
2-4	500 ft from HHD	132027	181690	49663	0.4584
2-5	1000 ft from HHD	170962	237825	66863	0.6172
2-6	5000 ft from HHD	69312	95499	26187	0.2417
2-7	10,000 ft HHD	52565	72733	20169	0.1862
Reach 2 Avg. Abs. Diff.				39148	0.3613
3-1	50 ft from HHD	35268	47560	12291	0.3545
3-2	100 ft from HHD	46262	63156	16894	0.4872
3-3	200 ft from HHD	50507	70203	19697	0.5680
3-4	500 ft from HHD	79807	114941	35134	1.0132
3-5	1000 ft from HHD	109226	154939	45713	1.3183
3-6	5000 ft from HHD	76290	113898	37607	1.0846
3-7	10,000 ft HHD	81783	110130	28347	0.8175
Reach 3 Avg. Abs. Diff.				27955	0.8062
Overall Avg. Abs. Diff.		374910	496660	121750	0.2470

cfd = cubic feet per day.

* Avg. Abs. Diff. = Averaged Absolute Flow Rate Difference.

** The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

*** Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table C8. Cross-sectional groundwater flow comparison between Runs 9 and 1 in Stage 1.

w/o project					
X-section ID	Description	Run 1, Base Case, cfd	Run 9, K_L3A-Min**, cfd	Difference Run9-Run1, cfd	Unit Difference*** (Run9-Run1)/L, cfd/ft
1-1	50 ft from HHD	213317	106831	-106486	-0.3044
1-2	100 ft from HHD	223694	110744	-112950	-0.3229
1-3	200 ft from HHD	248059	115094	-132965	-0.3801
1-4	500 ft from HHD	250382	112556	-137827	-0.3940
1-5	1000 ft from HHD	219210	88441	-130769	-0.3738
1-6	5000 ft from HHD	157356	70011	-87345	-0.2497
1-7	10,000 ft HHD	99515	44099	-55416	-0.1584
Reach 1 Avg. Abs. Diff.*				109108	0.3119
2-1	50 ft from HHD	82590	26133	-56457	-0.5211
2-2	100 ft from HHD	106002	33630	-72372	-0.6680
2-3	200 ft from HHD	120240	36939	-83301	-0.7689
2-4	500 ft from HHD	132027	38522	-93505	-0.8631
2-5	1000 ft from HHD	170962	48879	-122083	-1.1268
2-6	5000 ft from HHD	69312	18861	-50451	-0.4657
2-7	10,000 ft HHD	52565	12408	-40156	-0.3706
Reach 2 Avg. Abs. Diff.				74046	0.6835
3-1	50 ft from HHD	35268	12348	-22921	-0.6610
3-2	100 ft from HHD	46262	14698	-31564	-0.9103
3-3	200 ft from HHD	50507	14274	-36232	-1.0449
3-4	500 ft from HHD	79807	19477	-60330	-1.7399
3-5	1000 ft from HHD	109226	37589	-71637	-2.0660
3-6	5000 ft from HHD	76290	19325	-56965	-1.6428
3-7	10,000 ft HHD	81783	38566	-43216	-1.2463
Reach 3 Avg. Abs. Diff.				46124	1.3302
Overall Avg. Abs. Diff.		374910	145632	229278	0.4652

cfd = cubic feet per day.

* Avg. Abs. Diff. = Averaged Absolute Flow Rate Difference.

** The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

*** Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table C9. Cross-sectional groundwater flow comparison between Runs 10 and 1 in Stage 1.

w/o project					
X-section ID	Description	Run 1, Base Case, cfd	Run 10, K_L3B1-Max**, cfd	Difference Run10-Run1, cfd	Unit Difference*** (Run10-Run1)/L, cfd/ft
1-1	50 ft from HHD	213317	213476	160	0.0005
1-2	100 ft from HHD	223694	224047	353	0.0010
1-3	200 ft from HHD	248059	248798	740	0.0021
1-4	500 ft from HHD	250382	251489	1106	0.0032
1-5	1000 ft from HHD	219210	220519	1309	0.0037
1-6	5000 ft from HHD	157356	158096	740	0.0021
1-7	10,000 ft HHD	99515	100084	569	0.0016
Reach 1 Avg. Abs. Diff.*				711	0.0020
2-1	50 ft from HHD	82590	83899	1309	0.0121
2-2	100 ft from HHD	106002	107303	1301	0.0120
2-3	200 ft from HHD	120240	121390	1150	0.0106
2-4	500 ft from HHD	132027	132983	956	0.0088
2-5	1000 ft from HHD	170962	172122	1160	0.0107
2-6	5000 ft from HHD	69312	69882	570	0.0053
2-7	10,000 ft HHD	52565	52767	203	0.0019
Reach 2 Avg. Abs. Diff.				950	0.0088
3-1	50 ft from HHD	35268	35268	0	0.0000
3-2	100 ft from HHD	46262	46262	0	0.0000
3-3	200 ft from HHD	50507	50507	0	0.0000
3-4	500 ft from HHD	79807	79807	0	0.0000
3-5	1000 ft from HHD	109226	109226	0	0.0000
3-6	5000 ft from HHD	76290	76291	0	0.0000
3-7	10,000 ft HHD	81783	81783	0	0.0000
Reach 3 Avg. Abs. Diff.				0	0.0000
Overall Avg. Abs. Diff.		374910	376571	1661	0.0034

cfd = cubic feet per day.

* Avg. Abs. Diff. = Averaged Absolute Flow Rate Difference.

** The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

*** Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table C10. Cross-sectional groundwater flow comparison between Runs 11 and 1 in Stage 1.

w/o project					
X-section ID	Description	Run 1, Base Case, cfd	Run 11, K_L3B1-Min**, cfd	Difference Run11-Run1, cfd	Unit Difference*** (Run11-Run1)/L, cfd/ft
1-1	50 ft from HHD	213317	213264	-53	-0.0002
1-2	100 ft from HHD	223694	223581	-113	-0.0003
1-3	200 ft from HHD	248059	247728	-331	-0.0009
1-4	500 ft from HHD	250382	250002	-381	-0.0011
1-5	1000 ft from HHD	219210	218734	-476	-0.0014
1-6	5000 ft from HHD	157356	157026	-331	-0.0009
1-7	10,000 ft HHD	99515	99233	-282	-0.0008
Reach 1 Avg. Abs. Diff.*				281	0.0008
2-1	50 ft from HHD	82590	82114	-476	-0.0044
2-2	100 ft from HHD	106002	105532	-469	-0.0043
2-3	200 ft from HHD	120240	119817	-423	-0.0039
2-4	500 ft from HHD	132027	131664	-363	-0.0034
2-5	1000 ft from HHD	170962	170510	-451	-0.0042
2-6	5000 ft from HHD	69312	69167	-145	-0.0013
2-7	10,000 ft HHD	52565	52469	-95	-0.0009
Reach 2 Avg. Abs. Diff.				346	0.0032
3-1	50 ft from HHD	35268	35268	0	0.0000
3-2	100 ft from HHD	46262	46262	0	0.0000
3-3	200 ft from HHD	50507	50507	0	0.0000
3-4	500 ft from HHD	79807	79807	0	0.0000
3-5	1000 ft from HHD	109226	109226	0	0.0000
3-6	5000 ft from HHD	76290	76290	0	0.0000
3-7	10,000 ft HHD	81783	81783	0	0.0000
Reach 3 Avg. Abs. Diff.				0	0.0000
Overall Avg. Abs. Diff.		374910	374283	627	0.0013

cfd = cubic feet per day.

* Avg. Abs. Diff. = Averaged Absolute Flow Rate Difference.

** The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

*** Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table C11. Cross-sectional groundwater flow comparison between Runs 12 and 1 in Stage 1.

w/o project					
X-section ID	Description	Run 1, Base Case, cfd	Run 12, K_L3B2-Min**, cfd	Difference Run12-Run1, cfd	Unit Difference*** (Run12-Run1)/L, cfd/ft
1-1	50 ft from HHD	213317	240616	27299	0.0780
1-2	100 ft from HHD	223694	251057	27363	0.0782
1-3	200 ft from HHD	248059	274525	26466	0.0757
1-4	500 ft from HHD	250382	274138	23755	0.0679
1-5	1000 ft from HHD	219210	241274	22064	0.0631
1-6	5000 ft from HHD	157356	173146	15789	0.0451
1-7	10,000 ft HHD	99515	107891	8376	0.0239
Reach 1 Avg. Abs. Diff.*				21588	0.0617
2-1	50 ft from HHD	82590	84051	1462	0.0135
2-2	100 ft from HHD	106002	106414	413	0.0038
2-3	200 ft from HHD	120240	120361	121	0.0011
2-4	500 ft from HHD	132027	131998	-29	-0.0003
2-5	1000 ft from HHD	170962	172055	1093	0.0101
2-6	5000 ft from HHD	69312	69862	549	0.0051
2-7	10,000 ft HHD	52565	53904	1339	0.0124
Reach 2 Avg. Abs. Diff.				715	0.0066
3-1	50 ft from HHD	35268	34390	-878	-0.0253
3-2	100 ft from HHD	46262	44818	-1444	-0.0416
3-3	200 ft from HHD	50507	49888	-618	-0.0178
3-4	500 ft from HHD	79807	81807	2000	0.0577
3-5	1000 ft from HHD	109226	125265	16039	0.4625
3-6	5000 ft from HHD	76290	96462	20172	0.5817
3-7	10,000 ft HHD	81783	108999	27217	0.7849
Reach 3 Avg. Abs. Diff.				9767	0.2817
Overall Avg. Abs. Diff.		374910	406132	32070	0.0651

cfd = cubic feet per day.

* Avg. Abs. Diff. = Averaged Absolute Flow Rate Difference.

** The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

*** Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table C12. Cross-sectional groundwater flow comparison between Runs 13 and 1 in Stage 1.

w/o project					
X-section ID	Description	Run 1, Base Case, cfd	Run 13, K_L3B2-Min**, cfd	Difference Run13-Run1, cfd	Unit Difference*** (Run13-Run1)/L, cfd/ft
1-1	50 ft from HHD	213317	210304	-3013	-0.0086
1-2	100 ft from HHD	223694	220758	-2935	-0.0084
1-3	200 ft from HHD	248059	245635	-2423	-0.0069
1-4	500 ft from HHD	250382	248949	-1434	-0.0041
1-5	1000 ft from HHD	219210	215642	-3568	-0.0102
1-6	5000 ft from HHD	157356	155914	-1443	-0.0041
1-7	10,000 ft HHD	99515	99023	-492	-0.0014
Reach 1 Avg. Abs. Diff.*				2187	0.0063
2-1	50 ft from HHD	82590	81641	-949	-0.0088
2-2	100 ft from HHD	106002	105759	-243	-0.0022
2-3	200 ft from HHD	120240	120958	718	0.0066
2-4	500 ft from HHD	132027	133248	1222	0.0113
2-5	1000 ft from HHD	170962	171575	613	0.0057
2-6	5000 ft from HHD	69312	69580	268	0.0025
2-7	10,000 ft HHD	52565	52036	-528	-0.0049
Reach 2 Avg. Abs. Diff.				648	0.0060
3-1	50 ft from HHD	35268	36555	1286	0.0371
3-2	100 ft from HHD	46262	48207	1945	0.0561
3-3	200 ft from HHD	50507	52378	1871	0.0540
3-4	500 ft from HHD	79807	80190	383	0.0110
3-5	1000 ft from HHD	109226	107711	-1515	-0.0437
3-6	5000 ft from HHD	76290	73735	-2556	-0.0737
3-7	10,000 ft HHD	81783	78948	-2834	-0.0817
Reach 3 Avg. Abs. Diff.				1770	0.0510
Overall Avg. Abs. Diff.		374910	372678	4605	0.0093

cfd = cubic feet per day.

* Avg. Abs. Diff. = Averaged Absolute Flow Rate Difference.

** The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

*** Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table C13. Cross-sectional groundwater flow comparison between Runs 14 and 1 in Stage 1.

w/o project					
X-section ID	Description	Run 1, Base Case, cfd	Run 14, K_L4-Max**, cfd	Difference Run14-Run1, cfd	Unit Difference*** (Run14-Run1)/L, cfd/ft
1-1	50 ft from HHD	213317	217721	4404	0.0126
1-2	100 ft from HHD	223694	228637	4944	0.0141
1-3	200 ft from HHD	248059	251685	3627	0.0104
1-4	500 ft from HHD	250382	254905	4522	0.0129
1-5	1000 ft from HHD	219210	225721	6511	0.0186
1-6	5000 ft from HHD	157356	159929	2573	0.0074
1-7	10,000 ft HHD	99515	100636	1121	0.0032
Reach 1 Avg. Abs. Diff.*				3957	0.0113
2-1	50 ft from HHD	82590	86490	3900	0.0360
2-2	100 ft from HHD	106002	109535	3534	0.0326
2-3	200 ft from HHD	120240	122361	2121	0.0196
2-4	500 ft from HHD	132027	133328	1301	0.0120
2-5	1000 ft from HHD	170962	173419	2458	0.0227
2-6	5000 ft from HHD	69312	71980	2668	0.0246
2-7	10,000 ft HHD	52565	54018	1453	0.0134
Reach 2 Avg. Abs. Diff.				2491	0.0230
3-1	50 ft from HHD	35268	34703	-565	-0.0163
3-2	100 ft from HHD	46262	45171	-1091	-0.0315
3-3	200 ft from HHD	50507	49405	-1102	-0.0318
3-4	500 ft from HHD	79807	79274	-533	-0.0154
3-5	1000 ft from HHD	109226	112445	3219	0.0928
3-6	5000 ft from HHD	76290	82109	5819	0.1678
3-7	10,000 ft HHD	81783	89782	7999	0.2307
Reach 3 Avg. Abs. Diff.				2904	0.0837
Overall Avg. Abs. Diff.		374910	383322	9352	0.0190

cfd = cubic feet per day.

* Avg. Abs. Diff. = Averaged Absolute Flow Rate Difference.

** The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

*** Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table C14. Cross-sectional groundwater flow comparison between Runs 15 and 1 in Stage 1.

w/o project					
X-section ID	Description	Run 1, Base Case, cfd	Run 15, K_L4-Min**, cfd	Difference Run15-Run1, cfd	Unit Difference*** (Run15-Run1)/L, cfd/ft
1-1	50 ft from HHD	213317	212147	-1170	-0.0033
1-2	100 ft from HHD	223694	222372	-1322	-0.0038
1-3	200 ft from HHD	248059	247113	-946	-0.0027
1-4	500 ft from HHD	250382	249539	-843	-0.0024
1-5	1000 ft from HHD	219210	216368	-2842	-0.0081
1-6	5000 ft from HHD	157356	156565	-792	-0.0023
1-7	10,000 ft HHD	99515	99233	-283	-0.0008
Reach 1 Avg. Abs. Diff.*				1171	0.0033
2-1	50 ft from HHD	82590	80548	-2042	-0.0188
2-2	100 ft from HHD	106002	104308	-1694	-0.0156
2-3	200 ft from HHD	120240	119420	-820	-0.0076
2-4	500 ft from HHD	132027	131771	-256	-0.0024
2-5	1000 ft from HHD	170962	169988	-973	-0.0090
2-6	5000 ft from HHD	69312	68392	-920	-0.0085
2-7	10,000 ft HHD	52565	51615	-949	-0.0088
Reach 2 Avg. Abs. Diff.				1094	0.0101
3-1	50 ft from HHD	35268	35930	662	0.0191
3-2	100 ft from HHD	46262	47377	1115	0.0322
3-3	200 ft from HHD	50507	51743	1236	0.0356
3-4	500 ft from HHD	79807	80221	414	0.0119
3-5	1000 ft from HHD	109226	108420	-806	-0.0233
3-6	5000 ft from HHD	76290	74479	-1812	-0.0522
3-7	10,000 ft HHD	81783	79717	-2066	-0.0596
Reach 3 Avg. Abs. Diff.				1159	0.0334
Overall Avg. Abs. Diff.		374910	372466	3423	0.0069

cfd = cubic feet per day.

* Avg. Abs. Diff. = Averaged Absolute Flow Rate Difference.

** The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

*** Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table C15. Cross-sectional groundwater flow comparison between Runs 16 and 1 in Stage 1.

w/o project					
X-section ID	Description	Run 1, Base Case, cfd	Run 16, K_L5-Max**&, cfd	Difference Run16-Run1, cfd	Unit Difference*** (Run16-Run1)/L, cfd/ft
1-1	50 ft from HHD	213317	220533	7216	0.0206
1-2	100 ft from HHD	223694	231952	8259	0.0236
1-3	200 ft from HHD	248059	258889	10830	0.0310
1-4	500 ft from HHD	250382	259281	8899	0.0254
1-5	1000 ft from HHD	219210	226193	6983	0.0200
1-6	5000 ft from HHD	157356	165063	7706	0.0220
1-7	10,000 ft HHD	99515	104533	5018	0.0143
Reach 1 Avg. Abs. Diff.*				7845	0.0224
2-1	50 ft from HHD	82590	86894	4304	0.0397
2-2	100 ft from HHD	106002	110644	4643	0.0429
2-3	200 ft from HHD	120240	124004	3764	0.0347
2-4	500 ft from HHD	132027	132880	853	0.0079
2-5	1000 ft from HHD	170962	169197	-1764	-0.0163
2-6	5000 ft from HHD	69312	68365	-947	-0.0087
2-7	10,000 ft HHD	52565	52807	242	0.0022
Reach 2 Avg. Abs. Diff.				2360	0.0218
3-1	50 ft from HHD	35268	36633	1365	0.0394
3-2	100 ft from HHD	46262	47019	758	0.0219
3-3	200 ft from HHD	50507	48644	-1862	-0.0537
3-4	500 ft from HHD	79807	73791	-6015	-0.1735
3-5	1000 ft from HHD	109226	115293	6067	0.1750
3-6	5000 ft from HHD	76290	86164	9874	0.2848
3-7	10,000 ft HHD	81783	102232	20449	0.5897
Reach 3 Avg. Abs. Diff.				6627	0.1911
Overall Avg. Abs. Diff.		374910	388716	16831	0.0342

cfd = cubic feet per day.

* Avg. Abs. Diff. = Averaged Absolute Flow Rate Difference.

** The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

*** Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table C16. Cross-sectional groundwater flow comparison between Runs 17 and 1 in Stage 1.

w/o project					
X-section ID	Description	Run 1, Base Case, cfd	Run 17, K_L5-Min**, cfd	Difference Run17-Run1, cfd	Unit Difference*** (Run17-Run1)/L, cfd/ft
1-1	50 ft from HHD	213317	207092	-6225	-0.0178
1-2	100 ft from HHD	223694	215861	-7833	-0.0224
1-3	200 ft from HHD	248059	235211	-12847	-0.0367
1-4	500 ft from HHD	250382	236977	-13405	-0.0383
1-5	1000 ft from HHD	219210	206623	-12587	-0.0360
1-6	5000 ft from HHD	157356	147715	-9642	-0.0276
1-7	10,000 ft HHD	99515	93680	-5835	-0.0167
Reach 1 Avg. Abs. Diff.*				9768	0.0279
2-1	50 ft from HHD	82590	71902	-10688	-0.0987
2-2	100 ft from HHD	106002	95279	-10723	-0.0990
2-3	200 ft from HHD	120240	111051	-9189	-0.0848
2-4	500 ft from HHD	132027	126620	-5407	-0.0499
2-5	1000 ft from HHD	170962	167276	-3686	-0.0340
2-6	5000 ft from HHD	69312	67863	-1449	-0.0134
2-7	10,000 ft HHD	52565	52344	-220	-0.0020
Reach 2 Avg. Abs. Diff.				5909	0.0545
3-1	50 ft from HHD	35268	34672	-597	-0.0172
3-2	100 ft from HHD	46262	46514	252	0.0073
3-3	200 ft from HHD	50507	53311	2804	0.0809
3-4	500 ft from HHD	79807	85848	6042	0.1742
3-5	1000 ft from HHD	109226	105790	-3436	-0.0991
3-6	5000 ft from HHD	76290	69329	-6961	-0.2008
3-7	10,000 ft HHD	81783	64929	-16854	-0.4860
Reach 3 Avg. Abs. Diff.				5278	0.1522
Overall Avg. Abs. Diff.		374910	356555	20955	0.0425

cfd = cubic feet per day.

* Avg. Abs. Diff. = Averaged Absolute Flow Rate Difference.

** The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

*** Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table C17. Cross-sectional groundwater flow comparison between Runs 18 and 1 in Stage 1.

w/o project					
X-section ID	Description	Run 1, Base Case, cfd	Run 18, K_L6-Max**, cfd	Difference Run18-Run1, cfd	Unit Difference*** (Run18-Run1)/L, cfd/ft
1-1	50 ft from HHD	213317	213317	0	0.0000
1-2	100 ft from HHD	223694	223694	0	0.0000
1-3	200 ft from HHD	248059	248059	0	0.0000
1-4	500 ft from HHD	250382	250382	0	0.0000
1-5	1000 ft from HHD	219210	219210	0	0.0000
1-6	5000 ft from HHD	157356	157356	0	0.0000
1-7	10,000 ft HHD	99515	99515	0	0.0000
Reach 1 Avg. Abs. Diff.*				0	0.0000
2-1	50 ft from HHD	82590	82590	0	0.0000
2-2	100 ft from HHD	106002	106002	0	0.0000
2-3	200 ft from HHD	120240	120240	0	0.0000
2-4	500 ft from HHD	132027	132027	0	0.0000
2-5	1000 ft from HHD	170962	170962	0	0.0000
2-6	5000 ft from HHD	69312	69312	0	0.0000
2-7	10,000 ft HHD	52565	52565	0	0.0000
Reach 2 Avg. Abs. Diff.				0	0.0000
3-1	50 ft from HHD	35268	35268	0	0.0000
3-2	100 ft from HHD	46262	46262	0	0.0000
3-3	200 ft from HHD	50507	50507	0	0.0000
3-4	500 ft from HHD	79807	79807	0	0.0000
3-5	1000 ft from HHD	109226	109226	0	0.0000
3-6	5000 ft from HHD	76290	76290	0	0.0000
3-7	10,000 ft HHD	81783	81783	0	0.0000
Reach 3 Avg. Abs. Diff.				0	0.0000
Overall Avg. Abs. Diff.		374910	374910	0	0.0000

cfd = cubic feet per day.

* Avg. Abs. Diff. = Averaged Absolute Flow Rate Difference.

** The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

*** Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table C18. Cross-sectional groundwater flow comparison between Runs 19 and 1 in Stage 1.

w/o project					
X-section ID	Description	Run 1, Base Case, cfd	Run 19, K_L6-Min**, cfd	Difference Run19-Run1, cfd	Unit Difference*** (Run19-Run1)/L, cfd/ft
1-1	50 ft from HHD	213317	213504	187	0.0005
1-2	100 ft from HHD	223694	223907	213	0.0006
1-3	200 ft from HHD	248059	248860	801	0.0023
1-4	500 ft from HHD	250382	251645	1263	0.0036
1-5	1000 ft from HHD	219210	220696	1485	0.0042
1-6	5000 ft from HHD	157356	156939	-418	-0.0012
1-7	10,000 ft HHD	99515	99052	-463	-0.0013
Reach 1 Avg. Abs. Diff.*				690	0.0020
2-1	50 ft from HHD	82590	83260	670	0.0062
2-2	100 ft from HHD	106002	106773	772	0.0071
2-3	200 ft from HHD	120240	121089	849	0.0078
2-4	500 ft from HHD	132027	133162	1135	0.0105
2-5	1000 ft from HHD	170962	172589	1627	0.0150
2-6	5000 ft from HHD	69312	70012	700	0.0065
2-7	10,000 ft HHD	52565	53097	532	0.0049
Reach 2 Avg. Abs. Diff.				898	0.0083
3-1	50 ft from HHD	35268	35331	63	0.0018
3-2	100 ft from HHD	46262	46458	196	0.0057
3-3	200 ft from HHD	50507	50991	485	0.0140
3-4	500 ft from HHD	79807	80968	1161	0.0335
3-5	1000 ft from HHD	109226	108806	-421	-0.0121
3-6	5000 ft from HHD	76290	74644	-1647	-0.0475
3-7	10,000 ft HHD	81783	77334	-4449	-0.1283
Reach 3 Avg. Abs. Diff.				1203	0.0347
Overall Avg. Abs. Diff.		374910	375588	2791	0.0057

cfd = cubic feet per day.

* Avg. Abs. Diff. = Averaged Absolute Flow Rate Difference.

** The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

*** Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table C19. Cross-sectional groundwater flow comparison between Runs 20 and 1 in Stage 1.

w/o project					
X-section ID	Description	Run 1, Base Case, cfd	Run 20, K_L71-Max**, cfd	Difference Run20-Run1, cfd	Unit Difference*** (Run20-Run1)/L, cfd/ft
1-1	50 ft from HHD	213317	213269	-48	-0.0001
1-2	100 ft from HHD	223694	223561	-133	-0.0004
1-3	200 ft from HHD	248059	247652	-406	-0.0012
1-4	500 ft from HHD	250382	249706	-676	-0.0019
1-5	1000 ft from HHD	219210	217998	-1212	-0.0035
1-6	5000 ft from HHD	157356	156950	-406	-0.0012
1-7	10,000 ft HHD	99515	99203	-312	-0.0009
Reach 1 Avg. Abs. Diff.*				456	0.0013
2-1	50 ft from HHD	82590	81378	-1212	-0.0112
2-2	100 ft from HHD	106002	104793	-1208	-0.0112
2-3	200 ft from HHD	120240	119076	-1165	-0.0107
2-4	500 ft from HHD	132027	130947	-1080	-0.0100
2-5	1000 ft from HHD	170962	169849	-1113	-0.0103
2-6	5000 ft from HHD	69312	68507	-806	-0.0074
2-7	10,000 ft HHD	52565	52029	-536	-0.0049
Reach 2 Avg. Abs. Diff.				1017	0.0094
3-1	50 ft from HHD	35268	35268	0	0.0000
3-2	100 ft from HHD	46262	46262	0	0.0000
3-3	200 ft from HHD	50507	50506	0	0.0000
3-4	500 ft from HHD	79807	79807	0	0.0000
3-5	1000 ft from HHD	109226	109226	0	0.0000
3-6	5000 ft from HHD	76290	76290	0	0.0000
3-7	10,000 ft HHD	81783	81783	0	0.0000
Reach 3 Avg. Abs. Diff.				0	0.0000
Overall Avg. Abs. Diff.		374910	373437	1473	0.0030

cfd = cubic feet per day.

* Avg. Abs. Diff. = Averaged Absolute Flow Rate Difference.

** The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

*** Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table C20. Cross-sectional groundwater flow comparison between Runs 21 and 1 in Stage 1.

w/o project					
X-section ID	Description	Run 1, Base Case, cfd	Run 21, K_L71-Min**, cfd	Difference Run21-Run1, cfd	Unit Difference*** (Run21-Run1)/L, cfd/ft
1-1	50 ft from HHD	213317	213392	75	0.0002
1-2	100 ft from HHD	223694	223901	207	0.0006
1-3	200 ft from HHD	248059	248688	629	0.0018
1-4	500 ft from HHD	250382	251422	1040	0.0030
1-5	1000 ft from HHD	219210	220975	1765	0.0050
1-6	5000 ft from HHD	157356	157986	629	0.0018
1-7	10,000 ft HHD	99515	99997	482	0.0014
Reach 1 Avg. Abs. Diff.*				690	0.0020
2-1	50 ft from HHD	82590	84355	1765	0.0163
2-2	100 ft from HHD	106002	107760	1759	0.0162
2-3	200 ft from HHD	120240	121930	1690	0.0156
2-4	500 ft from HHD	132027	133585	1558	0.0144
2-5	1000 ft from HHD	170962	172573	1611	0.0149
2-6	5000 ft from HHD	69312	70448	1136	0.0105
2-7	10,000 ft HHD	52565	53290	725	0.0067
Reach 2 Avg. Abs. Diff.				1463	0.0135
3-1	50 ft from HHD	35268	35269	0	0.0000
3-2	100 ft from HHD	46262	46262	0	0.0000
3-3	200 ft from HHD	50507	50507	0	0.0000
3-4	500 ft from HHD	79807	79807	0	0.0000
3-5	1000 ft from HHD	109226	109227	0	0.0000
3-6	5000 ft from HHD	76290	76291	0	0.0000
3-7	10,000 ft HHD	81783	81783	0	0.0000
Reach 3 Avg. Abs. Diff.				0	0.0000
Overall Avg. Abs. Diff.		374910	377064	2153	0.0044

cfd = cubic feet per day.

* Avg. Abs. Diff. = Averaged Absolute Flow Rate Difference.

** The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

*** Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table C21. Cross-sectional groundwater flow comparison between Runs 22 and 1 in Stage 1.

w/o project					
X-section ID	Description	Run 1, Base Case, cfd	Run 22, K_L72-Max**, cfd	Difference Run22-Run1, cfd	Unit Difference*** (Run22-Run1)/L, cfd/ft
1-1	50 ft from HHD	213317	213224	-93	-0.0003
1-2	100 ft from HHD	223694	223586	-108	-0.0003
1-3	200 ft from HHD	248059	247894	-165	-0.0005
1-4	500 ft from HHD	250382	250196	-186	-0.0005
1-5	1000 ft from HHD	219210	218975	-235	-0.0007
1-6	5000 ft from HHD	157356	157233	-123	-0.0004
1-7	10,000 ft HHD	99515	99434	-82	-0.0002
Reach 1 Avg. Abs. Diff.*				142	0.0004
2-1	50 ft from HHD	82590	82444	-145	-0.0013
2-2	100 ft from HHD	106002	105861	-141	-0.0013
2-3	200 ft from HHD	120240	120109	-131	-0.0012
2-4	500 ft from HHD	132027	131905	-122	-0.0011
2-5	1000 ft from HHD	170962	170823	-139	-0.0013
2-6	5000 ft from HHD	69312	69237	-75	-0.0007
2-7	10,000 ft HHD	52565	52508	-57	-0.0005
Reach 2 Avg. Abs. Diff.				116	0.0011
3-1	50 ft from HHD	35268	35276	7	0.0002
3-2	100 ft from HHD	46262	46267	5	0.0002
3-3	200 ft from HHD	50507	50502	-4	-0.0001
3-4	500 ft from HHD	79807	79782	-25	-0.0007
3-5	1000 ft from HHD	109226	109233	7	0.0002
3-6	5000 ft from HHD	76290	76367	77	0.0022
3-7	10,000 ft HHD	81783	81957	174	0.0050
Reach 3 Avg. Abs. Diff.				43	0.0012
Overall Avg. Abs. Diff.		374910	374688	300	0.0006

cfd = cubic feet per day.

* Avg. Abs. Diff. = Averaged Absolute Flow Rate Difference.

** The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

*** Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table C22. Cross-sectional groundwater flow comparison between Runs 23 and 1 in Stage 1.

w/o project					
X-section ID	Description	Run 1, Base Case, cfd	Run 23, K_L72-Min**, cfd	Difference Run23-Run1, cfd	Unit Difference*** (Run23-Run1)/L, cfd/ft
1-1	50 ft from HHD	213317	213343	27	0.0001
1-2	100 ft from HHD	223694	223724	31	0.0001
1-3	200 ft from HHD	248059	248106	47	0.0001
1-4	500 ft from HHD	250382	250436	54	0.0002
1-5	1000 ft from HHD	219210	219280	69	0.0002
1-6	5000 ft from HHD	157356	157392	35	0.0001
1-7	10,000 ft HHD	99515	99538	23	0.0001
Reach 1 Avg. Abs. Diff.*				41	0.0001
2-1	50 ft from HHD	82590	82634	44	0.0004
2-2	100 ft from HHD	106002	106044	42	0.0004
2-3	200 ft from HHD	120240	120280	40	0.0004
2-4	500 ft from HHD	132027	132064	37	0.0003
2-5	1000 ft from HHD	170962	171004	42	0.0004
2-6	5000 ft from HHD	69312	69336	24	0.0002
2-7	10,000 ft HHD	52565	52583	18	0.0002
Reach 2 Avg. Abs. Diff.				35	0.0003
3-1	50 ft from HHD	35268	35266	-2	-0.0001
3-2	100 ft from HHD	46262	46260	-2	0.0000
3-3	200 ft from HHD	50507	50508	1	0.0000
3-4	500 ft from HHD	79807	79814	7	0.0002
3-5	1000 ft from HHD	109226	109224	-2	-0.0001
3-6	5000 ft from HHD	76290	76269	-22	-0.0006
3-7	10,000 ft HHD	81783	81733	-50	-0.0014
Reach 3 Avg. Abs. Diff.				12	0.0004
Overall Avg. Abs. Diff.		374910	374977	88	0.0002

cfd = cubic feet per day.

* Avg. Abs. Diff. = Averaged Absolute Flow Rate Difference.

** The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

*** Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table C23. Cross-sectional groundwater flow comparison between Runs 25 and 24 in Stage 1.

w/o project					
X-section ID	Description	Run 24, Base Case, cfd	Run 25, K_L1-Max**, cfd	Difference Run25-Run24, cfd	Unit Difference*** (Run25-Run24)/L, cfd/ft
1-1	50 ft from HHD	166922	167623	877	0.0025
1-2	100 ft from HHD	171047	171755	891	0.0025
1-3	200 ft from HHD	181511	181603	269	0.0008
1-4	500 ft from HHD	186569	186000	-405	-0.0012
1-5	1000 ft from HHD	161810	160594	-1094	-0.0031
1-6	5000 ft from HHD	110489	109361	-1068	-0.0031
1-7	10,000 ft HHD	60656	59803	-828	-0.0024
Reach 1 Avg. Abs. Diff.*				776	0.0022
2-1	50 ft from HHD	27611	26501	-1108	-0.0102
2-2	100 ft from HHD	39356	38239	-1101	-0.0102
2-3	200 ft from HHD	49866	48865	-968	-0.0089
2-4	500 ft from HHD	68627	67991	-565	-0.0052
2-5	1000 ft from HHD	108544	107749	-677	-0.0062
2-6	5000 ft from HHD	27420	26872	-528	-0.0049
2-7	10,000 ft HHD	12817	12703	-98	-0.0009
Reach 2 Avg. Abs. Diff.				721	0.0067
3-1	50 ft from HHD	2054	1980	-75	-0.0022
3-2	100 ft from HHD	19327	19502	175	0.0050
3-3	200 ft from HHD	34165	34749	584	0.0168
3-4	500 ft from HHD	67527	67951	424	0.0122
3-5	1000 ft from HHD	98164	97507	-658	-0.0190
3-6	5000 ft from HHD	68069	66770	-1299	-0.0375
3-7	10,000 ft HHD	71952	69446	-2506	-0.0723
Reach 3 Avg. Abs. Diff.				817	0.0236
Overall Avg. Abs. Diff.		247617	246223	2314	0.0047

cfd = cubic feet per day.

* Avg. Abs. Diff. = Averaged Absolute Flow Rate Difference.

** The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

*** Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table C24. Cross-sectional groundwater flow comparison between Runs 26 and 24 in Stage 1.

w/o project					
X-section ID	Description	Run 24, Base Case, cfd	Run 26, K_L1-Min**, cfd	Difference Run26-Run24, cfd	Unit Difference*** (Run26-Run24)/L, cfd/ft
1-1	50 ft from HHD	166746	163491	-3255	-0.0093
1-2	100 ft from HHD	170864	167574	-3290	-0.0094
1-3	200 ft from HHD	181334	181189	-145	-0.0004
1-4	500 ft from HHD	186406	189565	3159	0.0090
1-5	1000 ft from HHD	161688	165581	3893	0.0111
1-6	5000 ft from HHD	110429	114105	3677	0.0105
1-7	10,000 ft HHD	60631	63481	2850	0.0081
Reach 1 Avg. Abs. Diff.*				2895	0.0083
2-1	50 ft from HHD	27609	32232	4623	0.0427
2-2	100 ft from HHD	39340	43972	4632	0.0428
2-3	200 ft from HHD	49832	53758	3926	0.0362
2-4	500 ft from HHD	68557	70496	1940	0.0179
2-5	1000 ft from HHD	108426	109976	1549	0.0143
2-6	5000 ft from HHD	27401	28689	1288	0.0119
2-7	10,000 ft HHD	12800	11460	-1341	-0.0124
Reach 2 Avg. Abs. Diff.				2757	0.0254
3-1	50 ft from HHD	2054	2188	134	0.0039
3-2	100 ft from HHD	19327	18186	-1141	-0.0329
3-3	200 ft from HHD	34165	31110	-3055	-0.0881
3-4	500 ft from HHD	67527	63942	-3585	-0.1034
3-5	1000 ft from HHD	98164	98121	-43	-0.0013
3-6	5000 ft from HHD	68069	70679	2610	0.0753
3-7	10,000 ft HHD	71952	78811	6858	0.1978
Reach 3 Avg. Abs. Diff.				2490	0.0718
Overall Avg. Abs. Diff.		247617	251229	8142	0.0165

cfd = cubic feet per day.

* Avg. Abs. Diff. = Averaged Absolute Flow Rate Difference.

** The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

*** Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table C25. Cross-sectional groundwater flow comparison between Runs 27 and 24 in Stage 1.

w/o project					
X-section ID	Description	Run 24, Base Case, cfd	Run 27, K_L2-1-Max**, cfd	Difference Run27-Run24, cfd	Unit Difference*** (Run27-Run24)/L, cfd/ft
1-1	50 ft from HHD	166746	184915	18169	0.0519
1-2	100 ft from HHD	170864	189629	18765	0.0536
1-3	200 ft from HHD	181334	198382	17048	0.0487
1-4	500 ft from HHD	186406	201056	14651	0.0419
1-5	1000 ft from HHD	161688	170355	8667	0.0248
1-6	5000 ft from HHD	110429	111995	1566	0.0045
1-7	10,000 ft HHD	60631	60087	-544	-0.0016
Reach 1 Avg. Abs. Diff.*				11344	0.0324
2-1	50 ft from HHD	27609	26385	-1223	-0.0113
2-2	100 ft from HHD	39340	39641	301	0.0028
2-3	200 ft from HHD	49832	51773	1941	0.0179
2-4	500 ft from HHD	68557	73977	5420	0.0500
2-5	1000 ft from HHD	108426	117041	8615	0.0795
2-6	5000 ft from HHD	27401	28655	1254	0.0116
2-7	10,000 ft HHD	12800	13982	1182	0.0109
Reach 2 Avg. Abs. Diff.				2848	0.0263
3-1	50 ft from HHD	2054	1983	-71	-0.0021
3-2	100 ft from HHD	19327	22466	3139	0.0905
3-3	200 ft from HHD	34165	40304	6140	0.1771
3-4	500 ft from HHD	67527	75365	7838	0.2260
3-5	1000 ft from HHD	98164	98503	339	0.0098
3-6	5000 ft from HHD	68069	62216	-5853	-0.1688
3-7	10,000 ft HHD	71952	57176	-14776	-0.4261
Reach 3 Avg. Abs. Diff.				5451	0.1572
Overall Avg. Abs. Diff.		247617	260841	19643	0.0399

cfd = cubic feet per day.

* Avg. Abs. Diff. = Averaged Absolute Flow Rate Difference.

** The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

*** Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table C26. Cross-sectional groundwater flow comparison between Runs 28 and 24 in Stage 1.

w/o project					
X-section ID	Description	Run 24, Base Case, cfd	Run 28, K_L2-1-Min**, cfd	Difference Run28-Run24, cfd	Unit Difference*** (Run28-Run24)/L, cfd/ft
1-1	50 ft from HHD	166746	141089	-25657	-0.0733
1-2	100 ft from HHD	170864	144302	-26562	-0.0759
1-3	200 ft from HHD	181334	156062	-25272	-0.0722
1-4	500 ft from HHD	186406	163027	-23379	-0.0668
1-5	1000 ft from HHD	161688	143699	-17989	-0.0514
1-6	5000 ft from HHD	110429	100848	-9581	-0.0274
1-7	10,000 ft HHD	60631	56744	-3888	-0.0111
Reach 1 Avg. Abs. Diff.*				18904	0.0540
2-1	50 ft from HHD	27609	27663	55	0.0005
2-2	100 ft from HHD	39340	37858	-1482	-0.0137
2-3	200 ft from HHD	49832	45967	-3865	-0.0357
2-4	500 ft from HHD	68557	59670	-8886	-0.0820
2-5	1000 ft from HHD	108426	92340	-16086	-0.1485
2-6	5000 ft from HHD	27401	24961	-2440	-0.0225
2-7	10,000 ft HHD	12800	10689	-2112	-0.0195
Reach 2 Avg. Abs. Diff.				4989	0.0461
3-1	50 ft from HHD	2054	2008	-46	-0.0013
3-2	100 ft from HHD	19327	15252	-4075	-0.1175
3-3	200 ft from HHD	34165	25447	-8718	-0.2514
3-4	500 ft from HHD	67527	52343	-15184	-0.4379
3-5	1000 ft from HHD	98164	86403	-11761	-0.3392
3-6	5000 ft from HHD	68069	62779	-5289	-0.1525
3-7	10,000 ft HHD	71952	75509	3557	0.1026
Reach 3 Avg. Abs. Diff.				6947	0.2004
Overall Avg. Abs. Diff.		247617	217809	30840	0.0626

cfd = cubic feet per day.

* Avg. Abs. Diff. = Averaged Absolute Flow Rate Difference.

** The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

*** Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table C27. Cross-sectional groundwater flow comparison between Runs 29 and 24 in Stage 1.

w/o project					
X-section ID	Description	Run 24, Base Case, cfd	Run 29, K_L2-2-Max**, cfd	Difference Run29-Run24, cfd	Unit Difference*** (Run29-Run24)/L, cfd/ft
1-1	50 ft from HHD	166746	166751	6	0.0000
1-2	100 ft from HHD	170864	170871	7	0.0000
1-3	200 ft from HHD	181334	181232	-102	-0.0003
1-4	500 ft from HHD	186406	187479	1074	0.0031
1-5	1000 ft from HHD	161688	167578	5890	0.0168
1-6	5000 ft from HHD	110429	110325	-104	-0.0003
1-7	10,000 ft HHD	60631	60527	-105	-0.0003
Reach 1 Avg. Abs. Diff.*				1041	0.0030
2-1	50 ft from HHD	27609	33400	5791	0.0535
2-2	100 ft from HHD	39340	45180	5840	0.0539
2-3	200 ft from HHD	49832	55879	6047	0.0558
2-4	500 ft from HHD	68557	75040	6483	0.0598
2-5	1000 ft from HHD	108426	115228	6802	0.0628
2-6	5000 ft from HHD	27401	33554	6154	0.0568
2-7	10,000 ft HHD	12800	17778	4977	0.0459
Reach 2 Avg. Abs. Diff.				6014	0.0555
3-1	50 ft from HHD	2054	2051	-4	-0.0001
3-2	100 ft from HHD	19327	19599	272	0.0079
3-3	200 ft from HHD	34165	34869	704	0.0203
3-4	500 ft from HHD	67527	68467	940	0.0271
3-5	1000 ft from HHD	98164	99203	1039	0.0300
3-6	5000 ft from HHD	68069	68643	574	0.0165
3-7	10,000 ft HHD	71952	72210	257	0.0074
Reach 3 Avg. Abs. Diff.				541	0.0156
Overall Avg. Abs. Diff.		247617	255123	7596	0.0154

cfd = cubic feet per day.

* Avg. Abs. Diff. = Averaged Absolute Flow Rate Difference.

** The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

*** Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table C28. Cross-sectional groundwater flow comparison between Runs 30 and 24 in Stage 1.

w/o project					
X-section ID	Description	Run 24, Base Case, cfd	Run 30, K_L2-2-Min**, cfd	Difference Run30-Run24, cfd	Unit Difference*** (Run30-Run24)/L, cfd/ft
1-1	50 ft from HHD	166746	166583	-163	-0.0005
1-2	100 ft from HHD	170864	170734	-130	-0.0004
1-3	200 ft from HHD	181334	182830	1496	0.0043
1-4	500 ft from HHD	186406	190118	3713	0.0106
1-5	1000 ft from HHD	161688	163389	1701	0.0049
1-6	5000 ft from HHD	110429	111812	1383	0.0040
1-7	10,000 ft HHD	60631	61567	936	0.0027
Reach 1 Avg. Abs. Diff.*				1360	0.0039
2-1	50 ft from HHD	27609	29447	1838	0.0170
2-2	100 ft from HHD	39340	41301	1961	0.0181
2-3	200 ft from HHD	49832	51345	1512	0.0140
2-4	500 ft from HHD	68557	68888	331	0.0031
2-5	1000 ft from HHD	108426	108792	366	0.0034
2-6	5000 ft from HHD	27401	27246	-155	-0.0014
2-7	10,000 ft HHD	12800	10412	-2388	-0.0220
Reach 2 Avg. Abs. Diff.				1222	0.0113
3-1	50 ft from HHD	2054	2071	17	0.0005
3-2	100 ft from HHD	19327	18636	-691	-0.0199
3-3	200 ft from HHD	34165	32322	-1842	-0.0531
3-4	500 ft from HHD	67527	65581	-1946	-0.0561
3-5	1000 ft from HHD	98164	98170	6	0.0002
3-6	5000 ft from HHD	68069	69282	1213	0.0350
3-7	10,000 ft HHD	71952	73455	1502	0.0433
Reach 3 Avg. Abs. Diff.				1031	0.0297
Overall Avg. Abs. Diff.		247617	249140	3613	0.0073

cfd = cubic feet per day.

* Avg. Abs. Diff. = Averaged Absolute Flow Rate Difference.

** The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

*** Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table C29. Cross-sectional groundwater flow comparison between Runs 31 and 24 in Stage 1.

w/o project					
X-section ID	Description	Run 24, Base Case, cfd	Run 31, K_L3A-Max**, cfd	Difference Run31-Run24, cfd	Unit Difference*** (Run31-Run24)/L, cfd/ft
1-1	50 ft from HHD	166746	199581	32835	0.0939
1-2	100 ft from HHD	170864	204697	33833	0.0967
1-3	200 ft from HHD	181334	219082	37748	0.1079
1-4	500 ft from HHD	186406	227452	41047	0.1173
1-5	1000 ft from HHD	161688	201478	39790	0.1137
1-6	5000 ft from HHD	110429	136081	25653	0.0733
1-7	10,000 ft HHD	60631	75083	14452	0.0413
Reach 1 Avg. Abs. Diff.*				32194	0.0920
2-1	50 ft from HHD	27609	35965	8356	0.0771
2-2	100 ft from HHD	39340	50888	11548	0.1066
2-3	200 ft from HHD	49832	64699	14867	0.1372
2-4	500 ft from HHD	68557	90022	21466	0.1981
2-5	1000 ft from HHD	108426	144682	36256	0.3346
2-6	5000 ft from HHD	27401	36530	9129	0.0843
2-7	10,000 ft HHD	12800	17736	4936	0.0456
Reach 2 Avg. Abs. Diff.				15223	0.1405
3-1	50 ft from HHD	2054	2388	334	0.0096
3-2	100 ft from HHD	19327	24867	5540	0.1598
3-3	200 ft from HHD	34165	45370	11206	0.3232
3-4	500 ft from HHD	67527	94016	26489	0.7639
3-5	1000 ft from HHD	98164	134157	35992	1.0380
3-6	5000 ft from HHD	68069	98120	30051	0.8667
3-7	10,000 ft HHD	71952	92756	20804	0.6000
Reach 3 Avg. Abs. Diff.				18631	0.5373
Overall Avg. Abs. Diff.		247617	313665	66047	0.1340

cfd = cubic feet per day.

* Avg. Abs. Diff. = Averaged Absolute Flow Rate Difference.

** The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

*** Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table C30. Cross-sectional groundwater flow comparison between Runs 32 and 24 in Stage 1.

w/o project					
X-section ID	Description	Run 24, Base Case, cfd	Run 32, K_L3A-Min**, cfd	Difference Run32-Run24, cfd	Unit Difference*** (Run32-Run24)/L, cfd/ft
1-1	50 ft from HHD	166746	92761	-73985	-0.2115
1-2	100 ft from HHD	170864	94936	-75928	-0.2171
1-3	200 ft from HHD	181334	96692	-84642	-0.2420
1-4	500 ft from HHD	186406	95657	-90748	-0.2594
1-5	1000 ft from HHD	161688	73379	-88309	-0.2524
1-6	5000 ft from HHD	110429	56764	-53665	-0.1534
1-7	10,000 ft HHD	60631	32432	-28199	-0.0806
Reach 1 Avg. Abs. Diff.*				70782	0.2023
2-1	50 ft from HHD	27609	8860	-18749	-0.1731
2-2	100 ft from HHD	39340	13322	-26018	-0.2401
2-3	200 ft from HHD	49832	16359	-33473	-0.3090
2-4	500 ft from HHD	68557	21257	-47300	-0.4366
2-5	1000 ft from HHD	108426	33137	-75290	-0.6949
2-6	5000 ft from HHD	27401	6118	-21283	-0.1964
2-7	10,000 ft HHD	12800	-140	-12940	-0.1194
Reach 2 Avg. Abs. Diff.				33579	0.3099
3-1	50 ft from HHD	2054	1122	-932	-0.0269
3-2	100 ft from HHD	19327	7093	-12234	-0.3528
3-3	200 ft from HHD	34165	10802	-23363	-0.6738
3-4	500 ft from HHD	67527	17762	-49765	-1.4352
3-5	1000 ft from HHD	98164	36419	-61745	-1.7807
3-6	5000 ft from HHD	68069	18342	-49727	-1.4341
3-7	10,000 ft HHD	71952	36977	-34976	-1.0087
Reach 3 Avg. Abs. Diff.				33249	0.9589
Overall Avg. Abs. Diff.		247617	110047	137610	0.2792

cfd = cubic feet per day.

* Avg. Abs. Diff. = Averaged Absolute Flow Rate Difference.

** The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

*** Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table C31. Cross-sectional groundwater flow comparison between Runs 33 and 24 in Stage 1.

w/o project					
X-section ID	Description	Run 24, Base Case, cfd	Run 33, K_L3B1-Max**, cfd	Difference Run33-Run24, cfd	Unit Difference*** (Run33-Run24)/L, cfd/ft
1-1	50 ft from HHD	166746	165515	-1230	-0.0035
1-2	100 ft from HHD	170864	173288	2424	0.0069
1-3	200 ft from HHD	181334	191538	10204	0.0292
1-4	500 ft from HHD	186406	197775	11370	0.0325
1-5	1000 ft from HHD	161688	173801	12112	0.0346
1-6	5000 ft from HHD	110429	120633	10204	0.0292
1-7	10,000 ft HHD	60631	68953	8322	0.0238
Reach 1 Avg. Abs. Diff.*				7981	0.0228
2-1	50 ft from HHD	27609	39721	12112	0.1118
2-2	100 ft from HHD	39340	53552	14212	0.1312
2-3	200 ft from HHD	49832	63175	13343	0.1232
2-4	500 ft from HHD	68557	78246	9689	0.0894
2-5	1000 ft from HHD	108426	116633	8207	0.0758
2-6	5000 ft from HHD	27401	29309	1908	0.0176
2-7	10,000 ft HHD	12800	13543	743	0.0069
Reach 2 Avg. Abs. Diff.				8602	0.0794
3-1	50 ft from HHD	2054	2054	0	0.0000
3-2	100 ft from HHD	19327	19327	0	0.0000
3-3	200 ft from HHD	34165	34165	0	0.0000
3-4	500 ft from HHD	67527	67527	0	0.0000
3-5	1000 ft from HHD	98164	98164	0	0.0000
3-6	5000 ft from HHD	68069	68069	0	0.0000
3-7	10,000 ft HHD	71952	71952	0	0.0000
Reach 3 Avg. Abs. Diff.				0	0.0000
Overall Avg. Abs. Diff.		247617	263849	16583	0.0336

cfd = cubic feet per day.

* Avg. Abs. Diff. = Averaged Absolute Flow Rate Difference.

** The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

*** Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table C32. Cross-sectional groundwater flow comparison between Runs 34 and 24 in Stage 1.

w/o project					
X-section ID	Description	Run 24, Base Case, cfd	Run 34, K_L3B1-Min**, cfd	Difference Run34-Run24, cfd	Unit Difference*** (Run34-Run24)/L, cfd/ft
1-1	50 ft from HHD	166746	168082	1336	0.0038
1-2	100 ft from HHD	170864	171661	797	0.0023
1-3	200 ft from HHD	181334	178559	-2775	-0.0079
1-4	500 ft from HHD	186406	183131	-3274	-0.0094
1-5	1000 ft from HHD	161688	158005	-3683	-0.0105
1-6	5000 ft from HHD	110429	107537	-2892	-0.0083
1-7	10,000 ft HHD	60656	58665	-1966	-0.0056
Reach 1 Avg. Abs. Diff.*				2389	0.0068
2-1	50 ft from HHD	27609	23806	-3803	-0.0351
2-2	100 ft from HHD	39340	34602	-4737	-0.0437
2-3	200 ft from HHD	49832	44901	-4932	-0.0455
2-4	500 ft from HHD	68557	64208	-4349	-0.0401
2-5	1000 ft from HHD	108426	104216	-4210	-0.0389
2-6	5000 ft from HHD	27401	26566	-834	-0.0077
2-7	10,000 ft HHD	12800	12448	-352	-0.0032
Reach 2 Avg. Abs. Diff.				3317	0.0306
3-1	50 ft from HHD	2054	2055	1	0.0000
3-2	100 ft from HHD	19327	19359	32	0.0009
3-3	200 ft from HHD	34165	34230	65	0.0019
3-4	500 ft from HHD	67527	67630	103	0.0030
3-5	1000 ft from HHD	98164	98209	45	0.0013
3-6	5000 ft from HHD	68069	68060	-9	-0.0002
3-7	10,000 ft HHD	71952	71881	-71	-0.0020
Reach 3 Avg. Abs. Diff.				46	0.0013
Overall Avg. Abs. Diff.		247617	242545	5752	0.0117

cfd = cubic feet per day.

* Avg. Abs. Diff. = Averaged Absolute Flow Rate Difference.

** The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

*** Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table C33. Cross-sectional groundwater flow comparison between Runs 35 and 24 in Stage 1.

w/o project					
X-section ID	Description	Run 24, Base Case, cfd	Run 35, K_L3B2-Max**, cfd	Difference Run35-Run24, cfd	Unit Difference*** (Run35-Run24)/L, cfd/ft
1-1	50 ft from HHD	166746	218370	51625	0.1476
1-2	100 ft from HHD	170864	222216	51352	0.1468
1-3	200 ft from HHD	181334	229626	48292	0.1381
1-4	500 ft from HHD	186406	228298	41892	0.1198
1-5	1000 ft from HHD	161688	195512	33824	0.0967
1-6	5000 ft from HHD	110429	132364	21935	0.0627
1-7	10,000 ft HHD	60631	71933	11302	0.0323
Reach 1 Avg. Abs. Diff.*				37175	0.1063
2-1	50 ft from HHD	27609	26139	-1469	-0.0136
2-2	100 ft from HHD	39340	42933	3594	0.0332
2-3	200 ft from HHD	49832	59700	9868	0.0911
2-4	500 ft from HHD	68557	82231	13674	0.1262
2-5	1000 ft from HHD	108426	125953	17526	0.1618
2-6	5000 ft from HHD	27401	38976	11576	0.1068
2-7	10,000 ft HHD	12800	25271	12471	0.1151
Reach 2 Avg. Abs. Diff.				10025	0.0925
3-1	50 ft from HHD	2054	7999	5945	0.1715
3-2	100 ft from HHD	19327	32403	13076	0.3771
3-3	200 ft from HHD	34165	45858	11693	0.3372
3-4	500 ft from HHD	67527	79561	12034	0.3471
3-5	1000 ft from HHD	98164	122786	24622	0.7101
3-6	5000 ft from HHD	68069	94365	26296	0.7584
3-7	10,000 ft HHD	71952	106487	34535	0.9960
Reach 3 Avg. Abs. Diff.				18314	0.5282
Overall Avg. Abs. Diff.		247617	312712	65515	0.1329

cfd = cubic feet per day.

* Avg. Abs. Diff. = Averaged Absolute Flow Rate Difference.

** The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

*** Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table C34. Cross-sectional groundwater flow comparison between Runs 36 and 24 in Stage 1.

w/o project					
X-section ID	Description	Run 24, Base Case, cfd	Run 36, K_L3B2-Min**, cfd	Difference Run36-Run24, cfd	Unit Difference*** (Run36-Run24)/L, cfd/ft
1-1	50 ft from HHD	166746	122141	-44604	-0.1275
1-2	100 ft from HHD	170864	124503	-46361	-0.1325
1-3	200 ft from HHD	181334	138969	-42365	-0.1211
1-4	500 ft from HHD	186406	149290	-37116	-0.1061
1-5	1000 ft from HHD	161688	133000	-28688	-0.0820
1-6	5000 ft from HHD	110429	96070	-14359	-0.0410
1-7	10,000 ft HHD	60631	54110	-6521	-0.0186
Reach 1 Avg. Abs. Diff.*				31431	0.0899
2-1	50 ft from HHD	27609	32037	4428	0.0409
2-2	100 ft from HHD	39340	36668	-2672	-0.0247
2-3	200 ft from HHD	49832	39159	-10673	-0.0985
2-4	500 ft from HHD	68557	50649	-17908	-0.1653
2-5	1000 ft from HHD	108426	84794	-23632	-0.2181
2-6	5000 ft from HHD	27401	14856	-12544	-0.1158
2-7	10,000 ft HHD	12800	-553	-13353	-0.1233
Reach 2 Avg. Abs. Diff.				12173	0.1124
3-1	50 ft from HHD	2054	-3128	-5182	-0.1494
3-2	100 ft from HHD	19327	2339	-16988	-0.4899
3-3	200 ft from HHD	34165	16391	-17774	-0.5126
3-4	500 ft from HHD	67527	49384	-18143	-0.5232
3-5	1000 ft from HHD	98164	78866	-19298	-0.5565
3-6	5000 ft from HHD	68069	53790	-14279	-0.4118
3-7	10,000 ft HHD	71952	55436	-16516	-0.4763
Reach 3 Avg. Abs. Diff.				15454	0.4457
Overall Avg. Abs. Diff.		247617	190876	59058	0.1198

cfd = cubic feet per day.

* Avg. Abs. Diff. = Averaged Absolute Flow Rate Difference.

** The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

*** Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table C35. Cross-sectional groundwater flow comparison between Runs 37 and 24 in Stage 1.

w/o project					
X-section ID	Description	Run 24, Base Case, cfd	Run 37, K_L4-Max**, cfd	Difference Run37-Run24, cfd	Unit Difference*** (Run37-Run24)/L, cfd/ft
1-1	50 ft from HHD	166746	175685	8939	0.0256
1-2	100 ft from HHD	170864	179663	8799	0.0252
1-3	200 ft from HHD	181334	190348	9014	0.0258
1-4	500 ft from HHD	186406	197437	11032	0.0315
1-5	1000 ft from HHD	161688	174148	12460	0.0356
1-6	5000 ft from HHD	110429	116001	5572	0.0159
1-7	10,000 ft HHD	60631	63566	2935	0.0084
Reach 1 Avg. Abs. Diff.*				8393	0.0240
2-1	50 ft from HHD	27609	34513	6905	0.0637
2-2	100 ft from HHD	39340	43563	4224	0.0390
2-3	200 ft from HHD	49832	51198	1366	0.0126
2-4	500 ft from HHD	68557	70625	2068	0.0191
2-5	1000 ft from HHD	108426	114104	5678	0.0524
2-6	5000 ft from HHD	27401	28569	1168	0.0108
2-7	10,000 ft HHD	12800	12205	-595	-0.0055
Reach 2 Avg. Abs. Diff.				3143	0.0290
3-1	50 ft from HHD	2054	-1180	-3234	-0.0933
3-2	100 ft from HHD	19327	15095	-4232	-0.1221
3-3	200 ft from HHD	34165	33388	-777	-0.0224
3-4	500 ft from HHD	67527	69438	1911	0.0551
3-5	1000 ft from HHD	98164	104367	6203	0.1789
3-6	5000 ft from HHD	68069	75329	7261	0.2094
3-7	10,000 ft HHD	71952	81475	9523	0.2746
Reach 3 Avg. Abs. Diff.				4734	0.1365
Overall Avg. Abs. Diff.		247617	261700	16271	0.0330

cfd = cubic feet per day.

* Avg. Abs. Diff. = Averaged Absolute Flow Rate Difference.

** The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

*** Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table C36. Cross-sectional groundwater flow comparison between Runs 38 and 24 in Stage 1.

w/o project					
X-section ID	Description	Run 24, Base Case, cfd	Run 38, K_L4-Min**, cfd	Difference Run38-Run24, cfd	Unit Difference*** (Run38-Run24)/L, cfd/ft
1-1	50 ft from HHD	166746	164409	-2337	-0.0067
1-2	100 ft from HHD	170864	169215	-1649	-0.0047
1-3	200 ft from HHD	181334	178356	-2978	-0.0085
1-4	500 ft from HHD	186406	182500	-3906	-0.0112
1-5	1000 ft from HHD	161688	155660	-6028	-0.0172
1-6	5000 ft from HHD	110429	108490	-1939	-0.0055
1-7	10,000 ft HHD	60631	60153	-478	-0.0014
Reach 1 Avg. Abs. Diff.*				2759	0.0079
2-1	50 ft from HHD	27609	23773	-3835	-0.0354
2-2	100 ft from HHD	39340	36900	-2440	-0.0225
2-3	200 ft from HHD	49832	48811	-1021	-0.0094
2-4	500 ft from HHD	68557	66757	-1800	-0.0166
2-5	1000 ft from HHD	108426	104360	-4067	-0.0375
2-6	5000 ft from HHD	27401	27111	-289	-0.0027
2-7	10,000 ft HHD	12800	12986	186	0.0017
Reach 2 Avg. Abs. Diff.				1948	0.0180
3-1	50 ft from HHD	2054	4045	1991	0.0574
3-2	100 ft from HHD	19327	22570	3244	0.0935
3-3	200 ft from HHD	34165	35511	1346	0.0388
3-4	500 ft from HHD	67527	66735	-792	-0.0228
3-5	1000 ft from HHD	98164	95420	-2744	-0.0791
3-6	5000 ft from HHD	68069	65205	-2864	-0.0826
3-7	10,000 ft HHD	71952	68787	-3165	-0.0913
Reach 3 Avg. Abs. Diff.				2307	0.0665
Overall Avg. Abs. Diff.		247617	242536	7014	0.0142

cfd = cubic feet per day.

* Avg. Abs. Diff. = Averaged Absolute Flow Rate Difference.

** The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

*** Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table C37. Cross-sectional groundwater flow comparison between Runs 39 and 24 in Stage 1.

w/o project					
X-section ID	Description	Run 24, Base Case, cfd	Run 39, K_L5-Max**, cfd	Difference Run39-Run24, cfd	Unit Difference*** (Run39-Run24)/L, cfd/ft
1-1	50 ft from HHD	166746	170959	4213	0.0120
1-2	100 ft from HHD	170864	174956	4092	0.0117
1-3	200 ft from HHD	181334	185596	4262	0.0122
1-4	500 ft from HHD	186406	189115	2709	0.0077
1-5	1000 ft from HHD	161688	162317	629	0.0018
1-6	5000 ft from HHD	110429	112409	1980	0.0057
1-7	10,000 ft HHD	60631	61255	623	0.0018
Reach 1 Avg. Abs. Diff.*				2644	0.0076
2-1	50 ft from HHD	27609	26723	-885	-0.0082
2-2	100 ft from HHD	39340	38231	-1108	-0.0102
2-3	200 ft from HHD	49832	48031	-1801	-0.0166
2-4	500 ft from HHD	68557	64719	-3837	-0.0354
2-5	1000 ft from HHD	108426	102878	-5548	-0.0512
2-6	5000 ft from HHD	27401	24870	-2531	-0.0234
2-7	10,000 ft HHD	12800	11191	-1609	-0.0149
Reach 2 Avg. Abs. Diff.				2474	0.0228
3-1	50 ft from HHD	2054	2488	434	0.0125
3-2	100 ft from HHD	19327	18577	-750	-0.0216
3-3	200 ft from HHD	34165	31060	-3105	-0.0895
3-4	500 ft from HHD	67527	61141	-6386	-0.1842
3-5	1000 ft from HHD	98164	104164	6000	0.1730
3-6	5000 ft from HHD	68069	78166	10097	0.2912
3-7	10,000 ft HHD	71952	91187	19234	0.5547
Reach 3 Avg. Abs. Diff.				6572	0.1895
Overall Avg. Abs. Diff.		247617	251433	11691	0.0237

cfd = cubic feet per day.

* Avg. Abs. Diff. = Averaged Absolute Flow Rate Difference.

** The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

*** Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table C38. Cross-sectional groundwater flow comparison between Runs 40 and 24 in Stage 1.

w/o project					
X-section ID	Description	Run 24, Base Case, cfd	Run 40, K_L5-Min**, cfd	Difference Run40-Run24, cfd	Unit Difference*** (Run40-Run24)/L, cfd/ft
1-1	50 ft from HHD	166746	164505	-2240	-0.0064
1-2	100 ft from HHD	170864	168780	-2084	-0.0060
1-3	200 ft from HHD	181334	177396	-3938	-0.0113
1-4	500 ft from HHD	186406	181632	-4773	-0.0136
1-5	1000 ft from HHD	161688	158032	-3656	-0.0105
1-6	5000 ft from HHD	110429	108686	-1742	-0.0050
1-7	10,000 ft HHD	60631	61030	398	0.0011
Reach 1 Avg. Abs. Diff.*				2691	0.0077
2-1	50 ft from HHD	27609	24091	-3518	-0.0325
2-2	100 ft from HHD	39340	35970	-3369	-0.0311
2-3	200 ft from HHD	49832	47605	-2227	-0.0206
2-4	500 ft from HHD	68557	68710	153	0.0014
2-5	1000 ft from HHD	108426	109043	617	0.0057
2-6	5000 ft from HHD	27401	27575	174	0.0016
2-7	10,000 ft HHD	12800	14326	1526	0.0141
Reach 2 Avg. Abs. Diff.				1655	0.0153
3-1	50 ft from HHD	2054	1904	-150	-0.0043
3-2	100 ft from HHD	19327	21183	1856	0.0535
3-3	200 ft from HHD	34165	38499	4334	0.1250
3-4	500 ft from HHD	67527	74024	6497	0.1874
3-5	1000 ft from HHD	98164	94523	-3641	-0.1050
3-6	5000 ft from HHD	68069	60516	-7553	-0.2178
3-7	10,000 ft HHD	71952	56077	-15875	-0.4578
Reach 3 Avg. Abs. Diff.				5701	0.1644
Overall Avg. Abs. Diff.		247617	242015	10046	0.0204

cfd = cubic feet per day.

* Avg. Abs. Diff. = Averaged Absolute Flow Rate Difference.

** The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

*** Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table C39. Cross-sectional groundwater flow comparison between Runs 41 and 24 in Stage 1.

w/o project					
X-section ID	Description	Run 24, Base Case, cfd	Run 41, K_L6-Max**, cfd	Difference Run41-Run24, cfd	Unit Difference*** (Run41-Run24)/L, cfd/ft
1-1	50 ft from HHD	166746	166746	0	0.0000
1-2	100 ft from HHD	170864	170864	0	0.0000
1-3	200 ft from HHD	181334	181334	0	0.0000
1-4	500 ft from HHD	186406	186406	0	0.0000
1-5	1000 ft from HHD	161688	161688	0	0.0000
1-6	5000 ft from HHD	110429	110429	0	0.0000
1-7	10,000 ft HHD	60631	60631	0	0.0000
Reach 1 Avg. Abs. Diff.*				0	0.0000
2-1	50 ft from HHD	27609	27609	0	0.0000
2-2	100 ft from HHD	39340	39340	0	0.0000
2-3	200 ft from HHD	49832	49832	0	0.0000
2-4	500 ft from HHD	68557	68557	0	0.0000
2-5	1000 ft from HHD	108426	108426	0	0.0000
2-6	5000 ft from HHD	27401	27401	0	0.0000
2-7	10,000 ft HHD	12800	12800	0	0.0000
Reach 2 Avg. Abs. Diff.				0	0.0000
3-1	50 ft from HHD	2054	2054	0	0.0000
3-2	100 ft from HHD	19327	19327	0	0.0000
3-3	200 ft from HHD	34165	34165	0	0.0000
3-4	500 ft from HHD	67527	67527	0	0.0000
3-5	1000 ft from HHD	98164	98164	0	0.0000
3-6	5000 ft from HHD	68069	68069	0	0.0000
3-7	10,000 ft HHD	71952	71952	0	0.0000
Reach 3 Avg. Abs. Diff.				0	0.0000
Overall Avg. Abs. Diff.		247617	247617	0	0.0000

cfd = cubic feet per day.

* Avg. Abs. Diff. = Averaged Absolute Flow Rate Difference.

** The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

*** Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table C40. Cross-sectional groundwater flow comparison between Runs 42 and 24 in Stage 1.

w/o project					
X-section ID	Description	Run 24, Base Case, cfd	Run 42, K_L6-Min**, cfd	Difference Run42-Run24, cfd	Unit Difference*** (Run42-Run24)/L, cfd/ft
1-1	50 ft from HHD	166746	166240	-505	-0.0014
1-2	100 ft from HHD	170864	170671	-193	-0.0006
1-3	200 ft from HHD	181334	181856	522	0.0015
1-4	500 ft from HHD	186406	187076	671	0.0019
1-5	1000 ft from HHD	161688	162045	357	0.0010
1-6	5000 ft from HHD	110429	109103	-1326	-0.0038
1-7	10,000 ft HHD	60631	59789	-842	-0.0024
Reach 1 Avg. Abs. Diff.*				631	0.0018
2-1	50 ft from HHD	27609	28058	450	0.0042
2-2	100 ft from HHD	39340	40030	691	0.0064
2-3	200 ft from HHD	49832	50735	903	0.0083
2-4	500 ft from HHD	68557	69892	1335	0.0123
2-5	1000 ft from HHD	108426	110141	1715	0.0158
2-6	5000 ft from HHD	27401	28159	758	0.0070
2-7	10,000 ft HHD	12800	13404	604	0.0056
Reach 2 Avg. Abs. Diff.				922	0.0085
3-1	50 ft from HHD	2054	2085	30	0.0009
3-2	100 ft from HHD	19327	19812	485	0.0140
3-3	200 ft from HHD	34165	34963	798	0.0230
3-4	500 ft from HHD	67527	68766	1239	0.0357
3-5	1000 ft from HHD	98164	97491	-673	-0.0194
3-6	5000 ft from HHD	68069	66011	-2058	-0.0593
3-7	10,000 ft HHD	71952	67026	-4927	-0.1421
Reach 3 Avg. Abs. Diff.				1459	0.0421
Overall Avg. Abs. Diff.		247617	247622	3012	0.0061

cfd = cubic feet per day.

* Avg. Abs. Diff. = Averaged Absolute Flow Rate Difference.

** The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

*** Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table C41. Cross-sectional groundwater flow comparison between Runs 43 and 24 in Stage 1.

w/o project					
X-section ID	Description	Run 24, Base Case, cfd	Run 43, K_L71-Max**, cfd	Difference Run43-Run24, cfd	Unit Difference*** (Run43-Run24)/L, cfd/ft
1-1	50 ft from HHD	166746	166797	51	0.0001
1-2	100 ft from HHD	170864	170911	47	0.0001
1-3	200 ft from HHD	181334	181195	-139	-0.0004
1-4	500 ft from HHD	186406	186001	-405	-0.0012
1-5	1000 ft from HHD	161688	160766	-922	-0.0026
1-6	5000 ft from HHD	110429	110290	-139	-0.0004
1-7	10,000 ft HHD	60631	60559	-72	-0.0002
Reach 1 Avg. Abs. Diff.*				254	0.0007
2-1	50 ft from HHD	27609	26687	-922	-0.0085
2-2	100 ft from HHD	39340	38380	-959	-0.0089
2-3	200 ft from HHD	49832	48860	-973	-0.0090
2-4	500 ft from HHD	68557	67588	-969	-0.0089
2-5	1000 ft from HHD	108426	107393	-1033	-0.0095
2-6	5000 ft from HHD	27401	26618	-783	-0.0072
2-7	10,000 ft HHD	12800	12283	-517	-0.0048
Reach 2 Avg. Abs. Diff.				879	0.0081
3-1	50 ft from HHD	2054	2054	0	0.0000
3-2	100 ft from HHD	19327	19327	0	0.0000
3-3	200 ft from HHD	34165	34165	0	0.0000
3-4	500 ft from HHD	67527	67527	0	0.0000
3-5	1000 ft from HHD	98164	98164	0	0.0000
3-6	5000 ft from HHD	68069	68069	0	0.0000
3-7	10,000 ft HHD	71952	71952	0	0.0000
Reach 3 Avg. Abs. Diff.				0	0.0000
Overall Avg. Abs. Diff.		247617	246512	1133	0.0023

cfd = cubic feet per day.

* Avg. Abs. Diff. = Averaged Absolute Flow Rate Difference.

** The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

*** Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table C42. Cross-sectional groundwater flow comparison between Runs 44 and 24 in Stage 1.

w/o project					
X-section ID	Description	Run 24, Base Case, cfd	Run 44, K_L71-Min**, cfd	Difference Run44-Run24, cfd	Unit Difference*** (Run44-Run24)/L, cfd/ft
1-1	50 ft from HHD	166746	166843	97	0.0003
1-2	100 ft from HHD	170864	170974	110	0.0003
1-3	200 ft from HHD	181334	181726	392	0.0011
1-4	500 ft from HHD	186406	187185	779	0.0022
1-5	1000 ft from HHD	161688	163179	1491	0.0043
1-6	5000 ft from HHD	110429	110703	274	0.0008
1-7	10,000 ft HHD	60631	60765	134	0.0004
Reach 1 Avg. Abs. Diff.*				468	0.0013
2-1	50 ft from HHD	27609	28980	1372	0.0127
2-2	100 ft from HHD	39340	40784	1444	0.0133
2-3	200 ft from HHD	49832	51314	1482	0.0137
2-4	500 ft from HHD	68557	70069	1512	0.0140
2-5	1000 ft from HHD	108426	110086	1660	0.0153
2-6	5000 ft from HHD	27401	28574	1174	0.0108
2-7	10,000 ft HHD	12800	13570	769	0.0071
Reach 2 Avg. Abs. Diff.				1345	0.0124
3-1	50 ft from HHD	2054	2055	1	0.0000
3-2	100 ft from HHD	19327	19359	32	0.0009
3-3	200 ft from HHD	34165	34230	65	0.0019
3-4	500 ft from HHD	67527	67630	103	0.0030
3-5	1000 ft from HHD	98164	98210	45	0.0013
3-6	5000 ft from HHD	68069	68061	-8	-0.0002
3-7	10,000 ft HHD	71952	71881	-71	-0.0020
Reach 3 Avg. Abs. Diff.				47	0.0013
Overall Avg. Abs. Diff.		247617	249454	1860	0.0038

cfd = cubic feet per day.

* Avg. Abs. Diff. = Averaged Absolute Flow Rate Difference.

** The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

*** Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table C43. Cross-sectional groundwater flow comparison between Runs 45 and 24 in Stage 1.

w/o project					
X-section ID	Description	Run 24, Base Case, cfd	Run 45, K_L72-Max**, cfd	Difference Run45-Run24, cfd	Unit Difference*** (Run45-Run24)/L, cfd/ft
1-1	50 ft from HHD	166746	166651	-94	-0.0003
1-2	100 ft from HHD	170864	170739	-125	-0.0004
1-3	200 ft from HHD	181334	181087	-247	-0.0007
1-4	500 ft from HHD	186406	186178	-228	-0.0007
1-5	1000 ft from HHD	161688	161445	-243	-0.0007
1-6	5000 ft from HHD	110429	110259	-170	-0.0005
1-7	10,000 ft HHD	60631	60527	-105	-0.0003
Reach 1 Avg. Abs. Diff.*				173	0.0005
2-1	50 ft from HHD	27609	27438	-171	-0.0016
2-2	100 ft from HHD	39340	39155	-185	-0.0017
2-3	200 ft from HHD	49832	49655	-178	-0.0016
2-4	500 ft from HHD	68557	68396	-161	-0.0015
2-5	1000 ft from HHD	108426	108297	-129	-0.0012
2-6	5000 ft from HHD	27401	27356	-45	-0.0004
2-7	10,000 ft HHD	12800	12748	-53	-0.0005
Reach 2 Avg. Abs. Diff.				131	0.0012
3-1	50 ft from HHD	2054	2055	0	0.0000
3-2	100 ft from HHD	19327	19319	-8	-0.0002
3-3	200 ft from HHD	34165	34150	-15	-0.0004
3-4	500 ft from HHD	67527	67499	-28	-0.0008
3-5	1000 ft from HHD	98164	98176	12	0.0004
3-6	5000 ft from HHD	68069	68150	81	0.0023
3-7	10,000 ft HHD	71952	72123	171	0.0049
Reach 3 Avg. Abs. Diff.				45	0.0013
Overall Avg. Abs. Diff.		247617	247343	349	0.0007

cfd = cubic feet per day.

* Avg. Abs. Diff. = Averaged Absolute Flow Rate Difference.

** The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

*** Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table C44. Cross-sectional groundwater flow comparison between Runs 46 and 24 in Stage 1.

w/o project					
X-section ID	Description	Run 24, Base Case, cfd	Run 46, K_L72-Min**, cfd	Difference Run46-Run24, cfd	Unit Difference*** (Run46-Run24)/L, cfd/ft
1-1	50 ft from HHD	166746	166949	203	0.0006
1-2	100 ft from HHD	170864	171083	219	0.0006
1-3	200 ft from HHD	181334	181583	249	0.0007
1-4	500 ft from HHD	186406	186635	229	0.0007
1-5	1000 ft from HHD	161688	161883	195	0.0006
1-6	5000 ft from HHD	110429	110538	109	0.0003
1-7	10,000 ft HHD	60631	60686	55	0.0002
Reach 1 Avg. Abs. Diff.*				180	0.0005
2-1	50 ft from HHD	27609	27663	54	0.0005
2-2	100 ft from HHD	39340	39412	72	0.0007
2-3	200 ft from HHD	49832	49920	87	0.0008
2-4	500 ft from HHD	68557	68675	119	0.0011
2-5	1000 ft from HHD	108426	108583	156	0.0014
2-6	5000 ft from HHD	27401	27435	34	0.0003
2-7	10,000 ft HHD	12800	12833	33	0.0003
Reach 2 Avg. Abs. Diff.				79	0.0007
3-1	50 ft from HHD	2054	2055	0	0.0000
3-2	100 ft from HHD	19327	19361	34	0.0010
3-3	200 ft from HHD	34165	34234	69	0.0020
3-4	500 ft from HHD	67527	67637	110	0.0032
3-5	1000 ft from HHD	98164	98206	42	0.0012
3-6	5000 ft from HHD	68069	68037	-32	-0.0009
3-7	10,000 ft HHD	71952	71833	-120	-0.0035
Reach 3 Avg. Abs. Diff.				58	0.0017
Overall Avg. Abs. Diff.		247617	247891	318	0.0006

cfd = cubic feet per day.

* Avg. Abs. Diff. = Averaged Absolute Flow Rate Difference.

** The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

*** Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table C45. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 1 sensitivity analysis: base case.

X-section ID	Description	Run 1 vs. Run 24, Base Case*		Difference	Unit Difference**
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cft/ft
1-1	50 ft from HHD	213585	166922	-46663	-0.1334
1-2	100 ft from HHD	223968	171047	-52921	-0.1513
1-3	200 ft from HHD	248334	181511	-66823	-0.1910
1-4	500 ft from HHD	250633	186569	-64064	-0.1831
1-5	1000 ft from HHD	219396	161810	-57586	-0.1646
1-6	5000 ft from HHD	157455	110489	-46966	-0.1343
1-7	10,000 ft HHD	99567	60656	-38911	-0.1112
Reach 1 average		201848	148429	-53419	-0.1527
2-1	50 ft from HHD	82635	27611	-55024	-0.5079
2-2	100 ft from HHD	106090	39356	-66735	-0.6160
2-3	200 ft from HHD	120366	49866	-70500	-0.6507
2-4	500 ft from HHD	132196	68627	-63570	-0.5868
2-5	1000 ft from HHD	171187	108544	-62643	-0.5782
2-6	5000 ft from HHD	69409	27420	-41989	-0.3876
2-7	10,000 ft HHD	52657	12817	-39840	-0.3677
Reach 2 average		104934	47749	-57186	-0.5278
3-1	50 ft from HHD	35332	2055	-33277	-0.9597
3-2	100 ft from HHD	46351	19359	-26992	-0.7784
3-3	200 ft from HHD	50611	34230	-16381	-0.4724
3-4	500 ft from HHD	79941	67629	-12312	-0.3551
3-5	1000 ft from HHD	109291	98209	-11081	-0.3196
3-6	5000 ft from HHD	76291	68060	-8231	-0.2374
3-7	10,000 ft HHD	81720	71881	-9838	-0.2837
Reach 3 average		68505	51632	-16873	-0.4866
Overall average		373400	244917	-128483	-0.2587

cfd = cubic feet per day.

* The base case use the medium values of hydraulic conductivity for all 11 materials:

The low, medium, and high values of hydraulic conductivity for Material L1 are (0.5, 0.5, 0.5), (2.8, 2.8, 2.8), and (5, 5, 5) ft/d;

The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d; The low, medium, and high values of hydraulic conductivity for Material L2-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/d;

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d;

The low, medium, and high values of hydraulic conductivity for Material L3B-1 are (0.5, 0.5, 0.4), (1, 1, 0.8), and (5, 5, 4) ft/d;

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1, (10, 10, 10), and (100, 100, 100) ft/d;

The low, medium, and high values of hydraulic conductivity for Material L4 are (5, 5, 0.5), (10, 10, 1), and (30, 30, 3) ft/d;

The low, medium, and high values of hydraulic conductivity for Material L5 are (150, 150, 12), (400, 400, 32), and (750, 750, 60) ft/d;

The low, medium, and high values of hydraulic conductivity for Material L6 are (10, 10, 5), (35, 35, 17.5), and (35, 35, 17.5) ft/d;

The low, medium, and high values of hydraulic conductivity for Material L7-1 are (200, 200, 20), (500, 500, 50), and (1375, 1375, 137.5) ft/d;

The low, medium, and high values of hydraulic conductivity for Material L7-2 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d.

** Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table C46. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 1 sensitivity analysis: using high K value of L1.

		Run 2 vs. Run 25, high K of L1*		Difference	Unit Difference**
X-section ID	Description	w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cft/ft
1-1	50 ft from HHD	215639	167623	-48016	-0.1373
1-2	100 ft from HHD	225908	171755	-54152	-0.1548
1-3	200 ft from HHD	249484	181603	-67881	-0.1941
1-4	500 ft from HHD	250915	186000	-64915	-0.1856
1-5	1000 ft from HHD	218565	160594	-57972	-0.1657
1-6	5000 ft from HHD	156383	109361	-47023	-0.1344
1-7	10,000 ft HHD	98637	59803	-38834	-0.1110
Reach 1 average		202219	148106	-54113	-0.1547
2-1	50 ft from HHD	81745	26501	-55244	-0.5099
2-2	100 ft from HHD	105640	38239	-67401	-0.6221
2-3	200 ft from HHD	120454	48865	-71589	-0.6608
2-4	500 ft from HHD	132880	67991	-64888	-0.5989
2-5	1000 ft from HHD	171817	107749	-64067	-0.5914
2-6	5000 ft from HHD	70064	26872	-43192	-0.3987
2-7	10,000 ft HHD	53766	12703	-41063	-0.3790
Reach 2 average		105195	46989	-58206	-0.5373
3-1	50 ft from HHD	36336	1980	-34357	-0.9908
3-2	100 ft from HHD	47363	19502	-27862	-0.8035
3-3	200 ft from HHD	51777	34749	-17028	-0.4911
3-4	500 ft from HHD	80709	67951	-12758	-0.3679
3-5	1000 ft from HHD	108899	97507	-11392	-0.3285
3-6	5000 ft from HHD	75140	66770	-8370	-0.2414
3-7	10,000 ft HHD	79239	69446	-9793	-0.2824
Reach 3 average		68495	51129	-17366	-0.5008
Overall average		374373	243606	-130767	-0.2631

cfd = cubic feet per day.

* The low, medium, and high values of hydraulic conductivity for Material L1 are (0.5, 0.5, 0.5), (2.8, 2.8, 2.8), and (5, 5, 5) ft/d.

** Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table C47. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 1 sensitivity analysis: using low K value of L1.

X-section ID	Description	Run 3 vs. Run 26, Low K of L1*		Difference	Unit Difference**
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cft/ft
1-1	50 ft from HHD	207311	163491	-43820	-0.1253
1-2	100 ft from HHD	218355	167574	-50781	-0.1452
1-3	200 ft from HHD	246522	181189	-65332	-0.1868
1-4	500 ft from HHD	252888	189565	-63323	-0.1810
1-5	1000 ft from HHD	223772	165581	-58191	-0.1664
1-6	5000 ft from HHD	162185	114105	-48079	-0.1374
1-7	10,000 ft HHD	103677	63481	-40196	-0.1149
Reach 1 average		202101	149284	-52818	-0.1510
2-1	50 ft from HHD	88247	32232	-56015	-0.5170
2-2	100 ft from HHD	110171	43972	-66199	-0.6110
2-3	200 ft from HHD	122140	53758	-68381	-0.6312
2-4	500 ft from HHD	130762	70496	-60265	-0.5563
2-5	1000 ft from HHD	168706	109976	-58731	-0.5421
2-6	5000 ft from HHD	67518	28689	-38829	-0.3584
2-7	10,000 ft HHD	47866	11460	-36406	-0.3360
Reach 2 average		105058	50083	-54975	-0.5074
3-1	50 ft from HHD	32454	2188	-30265	-0.8728
3-2	100 ft from HHD	42517	18186	-24330	-0.7017
3-3	200 ft from HHD	45360	31110	-14250	-0.4110
3-4	500 ft from HHD	74681	63942	-10740	-0.3097
3-5	1000 ft from HHD	108162	98121	-10041	-0.2896
3-6	5000 ft from HHD	78471	70679	-7792	-0.2247
3-7	10,000 ft HHD	88763	78811	-9953	-0.2870
Reach 3 average		67201	51862	-15339	-0.4424
Overall average		371281	247380	-123901	-0.2499

cfd = cubic feet per day.

* The low, medium, and high values of hydraulic conductivity for Material L1 are (0.5, 0.5, 0.5), (2.8, 2.8, 2.8), and (5, 5, 5) ft/d.

** Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table C48. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 1 sensitivity analysis: using high K value of L2-1.

X-section ID	Description	Run 4 vs. Run 27, High K of L2-1*		Difference	Unit Difference**
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cft/ft
1-1	50 ft from HHD	245401	184915	-60486	-0.1729
1-2	100 ft from HHD	256583	189629	-66953	-0.1914
1-3	200 ft from HHD	279896	198382	-81514	-0.2330
1-4	500 ft from HHD	278096	201056	-77039	-0.2202
1-5	1000 ft from HHD	236798	170355	-66443	-0.1899
1-6	5000 ft from HHD	163579	111995	-51585	-0.1475
1-7	10,000 ft HHD	102026	60087	-41940	-0.1199
Reach 1 average		223197	159488	-63709	-0.1821
2-1	50 ft from HHD	86512	26385	-60126	-0.5550
2-2	100 ft from HHD	115286	39641	-75645	-0.6982
2-3	200 ft from HHD	133674	51773	-81900	-0.7560
2-4	500 ft from HHD	149837	73977	-75859	-0.7002
2-5	1000 ft from HHD	192899	117041	-75858	-0.7002
2-6	5000 ft from HHD	80230	28655	-51576	-0.4761
2-7	10,000 ft HHD	63282	13982	-49299	-0.4550
Reach 2 average		117388	50208	-67181	-0.6201
3-1	50 ft from HHD	43034	1983	-41051	-1.1839
3-2	100 ft from HHD	56673	22466	-34207	-0.9865
3-3	200 ft from HHD	61793	40304	-21489	-0.6197
3-4	500 ft from HHD	91648	75365	-16283	-0.4696
3-5	1000 ft from HHD	111899	98503	-13396	-0.3863
3-6	5000 ft from HHD	71239	62216	-9023	-0.2602
3-7	10,000 ft HHD	66928	57176	-9751	-0.2812
Reach 3 average		71888	51145	-20743	-0.5982
Overall average		413182	259980	-153202	-0.3077

cfd = cubic feet per day.

* The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d.

** Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table C49. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 1 sensitivity analysis: using low K value of L2-1.

X-section ID	Description	Run 5 vs. Run 28, Low K of L2-1*		Difference	Unit Difference**
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cft/ft
1-1	50 ft from HHD	176624	141089	-35535	-0.1016
1-2	100 ft from HHD	186196	144302	-41894	-0.1198
1-3	200 ft from HHD	211176	156062	-55115	-0.1576
1-4	500 ft from HHD	216608	163027	-53581	-0.1532
1-5	1000 ft from HHD	193395	143699	-49696	-0.1421
1-6	5000 ft from HHD	142803	100848	-41955	-0.1199
1-7	10,000 ft HHD	92109	56744	-35366	-0.1011
Reach 1 average		174130	129396	-44734	-0.1279
2-1	50 ft from HHD	77044	27663	-49381	-0.4558
2-2	100 ft from HHD	95695	37858	-57837	-0.5339
2-3	200 ft from HHD	105251	45967	-59283	-0.5472
2-4	500 ft from HHD	111464	59670	-51793	-0.4781
2-5	1000 ft from HHD	142394	92340	-50053	-0.4620
2-6	5000 ft from HHD	57906	24961	-32945	-0.3041
2-7	10,000 ft HHD	41641	10689	-30953	-0.2857
Reach 2 average		90199	42735	-47464	-0.4381
3-1	50 ft from HHD	27968	2008	-25960	-0.7487
3-2	100 ft from HHD	35721	15252	-20469	-0.5903
3-3	200 ft from HHD	37191	25447	-11744	-0.3387
3-4	500 ft from HHD	61001	52343	-8658	-0.2497
3-5	1000 ft from HHD	95104	86403	-8701	-0.2509
3-6	5000 ft from HHD	69709	62779	-6929	-0.1998
3-7	10,000 ft HHD	84258	75509	-8749	-0.2523
Reach 3 average		58707	45677	-13030	-0.3758
Overall average		319387	213547	-105840	-0.2135

cfd = cubic feet per day.

* The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d.

** Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table C50. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 1 sensitivity analysis: using high K value of L2-2.

X-section ID	Description	Run 6 vs. Run 29, High K of L2-2*		Difference	Unit Difference**
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cft/ft
1-1	50 ft from HHD	213352	166751	-46600	-0.1332
1-2	100 ft from HHD	223757	170871	-52886	-0.1512
1-3	200 ft from HHD	248237	181232	-67006	-0.1916
1-4	500 ft from HHD	252320	187479	-64841	-0.1854
1-5	1000 ft from HHD	226460	167578	-58882	-0.1683
1-6	5000 ft from HHD	157534	110325	-47209	-0.1350
1-7	10,000 ft HHD	99633	60527	-39107	-0.1118
Reach 1 average		203042	149252	-53790	-0.1538
2-1	50 ft from HHD	89891	33400	-56491	-0.5214
2-2	100 ft from HHD	113511	45180	-68331	-0.6307
2-3	200 ft from HHD	128122	55879	-72242	-0.6668
2-4	500 ft from HHD	140427	75040	-65387	-0.6035
2-5	1000 ft from HHD	179777	115228	-64548	-0.5958
2-6	5000 ft from HHD	77071	33554	-43516	-0.4017
2-7	10,000 ft HHD	58564	17778	-40786	-0.3765
Reach 2 average		112480	53723	-58757	-0.5423
3-1	50 ft from HHD	35682	2051	-33632	-0.9699
3-2	100 ft from HHD	46924	19599	-27324	-0.7880
3-3	200 ft from HHD	51548	34869	-16679	-0.4810
3-4	500 ft from HHD	80998	68467	-12531	-0.3614
3-5	1000 ft from HHD	110478	99203	-11275	-0.3252
3-6	5000 ft from HHD	76983	68643	-8340	-0.2405
3-7	10,000 ft HHD	82113	72210	-9903	-0.2856
Reach 3 average		69247	52149	-17098	-0.4931
Overall average		382930	252257	-130673	-0.2631

cfd = cubic feet per day.

** Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table C51. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 1 sensitivity analysis: using low K value of L2-2.

X-section ID	Description	Run 7 vs. Run 30, Low K of L2-2*		Difference	Unit Difference**
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cft/ft
1-1	50 ft from HHD	213567	166583	-46985	-0.1343
1-2	100 ft from HHD	224543	170734	-53809	-0.1538
1-3	200 ft from HHD	251140	182830	-68310	-0.1953
1-4	500 ft from HHD	255725	190118	-65606	-0.1876
1-5	1000 ft from HHD	222624	163389	-59235	-0.1693
1-6	5000 ft from HHD	160443	111812	-48630	-0.1390
1-7	10,000 ft HHD	102019	61567	-40452	-0.1156
Reach 1 average		204294	149576	-54718	-0.1564
2-1	50 ft from HHD	85867	29447	-56420	-0.5208
2-2	100 ft from HHD	108718	41301	-67417	-0.6223
2-3	200 ft from HHD	121652	51345	-70308	-0.6490
2-4	500 ft from HHD	131364	68888	-62476	-0.5767
2-5	1000 ft from HHD	169919	108792	-61127	-0.5642
2-6	5000 ft from HHD	67839	27246	-40594	-0.3747
2-7	10,000 ft HHD	48831	10412	-38419	-0.3546
Reach 2 average		104884	48204	-56680	-0.5232
3-1	50 ft from HHD	34201	2071	-32130	-0.9266
3-2	100 ft from HHD	44523	18636	-25887	-0.7466
3-3	200 ft from HHD	47716	32322	-15393	-0.4439
3-4	500 ft from HHD	77140	65581	-11560	-0.3334
3-5	1000 ft from HHD	108837	98170	-10666	-0.3076
3-6	5000 ft from HHD	77404	69282	-8123	-0.2343
3-7	10,000 ft HHD	83328	73455	-9873	-0.2847
Reach 3 average		67593	51359	-16233	-0.4682
Overall average		374524	245984	-128540	-0.2590

cfd = cubic feet per day.

* The low, medium, and high values of hydraulic conductivity for Material L2-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/d.

** Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table C52. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 1 sensitivity analysis: using high K value of L3A.

X-section ID	Description	Run 8 vs. Run 31, High K of L3A*		Difference	Unit Difference**
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cft/ft
1-1	50 ft from HHD	264428	199581	-64847	-0.1854
1-2	100 ft from HHD	278210	204697	-73513	-0.2102
1-3	200 ft from HHD	313899	219082	-94817	-0.2711
1-4	500 ft from HHD	319830	227452	-92378	-0.2641
1-5	1000 ft from HHD	285070	201478	-83591	-0.2390
1-6	5000 ft from HHD	203051	136081	-66970	-0.1914
1-7	10,000 ft HHD	129572	75083	-54489	-0.1558
Reach 1 average		256294	180494	-75801	-0.2167
2-1	50 ft from HHD	111981	35965	-76016	-0.7016
2-2	100 ft from HHD	143979	50888	-93091	-0.8592
2-3	200 ft from HHD	164027	64699	-99328	-0.9168
2-4	500 ft from HHD	181690	90022	-91668	-0.8461
2-5	1000 ft from HHD	237825	144682	-93143	-0.8597
2-6	5000 ft from HHD	95499	36530	-58970	-0.5443
2-7	10,000 ft HHD	72733	17736	-54997	-0.5076
Reach 2 average		143962	62932	-81030	-0.7479
3-1	50 ft from HHD	47560	2388	-45172	-1.3027
3-2	100 ft from HHD	63156	24867	-38289	-1.1042
3-3	200 ft from HHD	70203	45370	-24833	-0.7162
3-4	500 ft from HHD	114941	94016	-20925	-0.6035
3-5	1000 ft from HHD	154939	134157	-20783	-0.5994
3-6	5000 ft from HHD	113898	98120	-15778	-0.4550
3-7	10,000 ft HHD	110130	92756	-17373	-0.5010
Reach 3 average		96404	70239	-26165	-0.7546
Overall average		494699	310448	-184251	-0.3713

cfd = cubic feet per day.

* The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

** Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table C53. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 1 sensitivity analysis: using low K value of L3A.

X-section ID	Description	Run 9 vs. Run 32, Low K of L3A*		Difference	Unit Difference**
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cft/ft
1-1	50 ft from HHD	106831	92761	-14070	-0.0402
1-2	100 ft from HHD	110744	94936	-15808	-0.0452
1-3	200 ft from HHD	115094	96692	-18402	-0.0526
1-4	500 ft from HHD	112556	95657	-16898	-0.0483
1-5	1000 ft from HHD	88441	73379	-15062	-0.0431
1-6	5000 ft from HHD	70011	56764	-13247	-0.0379
1-7	10,000 ft HHD	44099	32432	-11667	-0.0334
Reach 1 average		92539	77517	-15022	-0.0429
2-1	50 ft from HHD	26133	8860	-17273	-0.1594
2-2	100 ft from HHD	33630	13322	-20307	-0.1874
2-3	200 ft from HHD	36939	16359	-20580	-0.1900
2-4	500 ft from HHD	38522	21257	-17265	-0.1594
2-5	1000 ft from HHD	48879	33137	-15742	-0.1453
2-6	5000 ft from HHD	18861	6118	-12743	-0.1176
2-7	10,000 ft HHD	12408	-140	-12548	-0.1158
Reach 2 average		30767	14130	-16637	-0.1536
3-1	50 ft from HHD	12348	1122	-11225	-0.3237
3-2	100 ft from HHD	14698	7093	-7604	-0.2193
3-3	200 ft from HHD	14274	10802	-3473	-0.1001
3-4	500 ft from HHD	19477	17762	-1715	-0.0495
3-5	1000 ft from HHD	37589	36419	-1170	-0.0338
3-6	5000 ft from HHD	19325	18342	-983	-0.0284
3-7	10,000 ft HHD	38566	36977	-1590	-0.0458
Reach 3 average		22325	18360	-3966	-0.1144
Overall average		143312	107348	-35964	-0.0723

cfd = cubic feet per day.

* The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

** Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table C54. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 1 sensitivity analysis: using high K value of L3B-1.

X-section ID	Description	Run 10 vs. Run 33, High K of L3B-1*		Difference	Unit Difference**
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cft/ft
1-1	50 ft from HHD	213476	165515	-47961	-0.1371
1-2	100 ft from HHD	224047	173288	-50759	-0.1451
1-3	200 ft from HHD	248798	191538	-57260	-0.1637
1-4	500 ft from HHD	251489	197775	-53713	-0.1536
1-5	1000 ft from HHD	220519	173801	-46719	-0.1336
1-6	5000 ft from HHD	158096	120633	-37463	-0.1071
1-7	10,000 ft HHD	100084	68953	-31131	-0.0890
Reach 1 average		202358	155929	-46429	-0.1327
2-1	50 ft from HHD	83899	39721	-44178	-0.4078
2-2	100 ft from HHD	107303	53552	-53751	-0.4961
2-3	200 ft from HHD	121390	63175	-58215	-0.5373
2-4	500 ft from HHD	132983	78246	-54737	-0.5052
2-5	1000 ft from HHD	172122	116633	-55488	-0.5122
2-6	5000 ft from HHD	69882	29309	-40573	-0.3745
2-7	10,000 ft HHD	52767	13543	-39224	-0.3620
Reach 2 average		105764	56311	-49452	-0.4565
3-1	50 ft from HHD	35268	2054	-33214	-0.9579
3-2	100 ft from HHD	46262	19327	-26935	-0.7768
3-3	200 ft from HHD	50507	34165	-16342	-0.4713
3-4	500 ft from HHD	79807	67527	-12280	-0.3541
3-5	1000 ft from HHD	109226	98164	-11062	-0.3190
3-6	5000 ft from HHD	76291	68069	-8222	-0.2371
3-7	10,000 ft HHD	81783	71952	-9831	-0.2835
Reach 3 average		68449	51608	-16841	-0.4857
Overall average		374666	260942	-113724	-0.2287

cfd = cubic feet per day.

* The low, medium, and high values of hydraulic conductivity for Material L3B-1 are (0.5, 0.5, 0.4), (1, 1, 0.8), and (5, 5, 4) ft/d.

** Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table C55. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 1 sensitivity analysis: using low K value of L3B-1.

X-section ID	Description	Run 11 vs. Run 34, Low K of L3B-1*		Difference	Unit Difference**
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cft/ft
1-1	50 ft from HHD	213264	168082	-45183	-0.1292
1-2	100 ft from HHD	223581	171661	-51920	-0.1484
1-3	200 ft from HHD	247728	178559	-69169	-0.1977
1-4	500 ft from HHD	250002	183131	-66870	-0.1912
1-5	1000 ft from HHD	218734	158005	-60729	-0.1736
1-6	5000 ft from HHD	157026	107537	-49489	-0.1415
1-7	10,000 ft HHD	99233	58665	-40568	-0.1160
Reach 1 average		201367	146520	-54847	-0.1568
2-1	50 ft from HHD	82114	23806	-58308	-0.5382
2-2	100 ft from HHD	105532	34602	-70930	-0.6547
2-3	200 ft from HHD	119817	44901	-74916	-0.6915
2-4	500 ft from HHD	131664	64208	-67456	-0.6226
2-5	1000 ft from HHD	170510	104216	-66294	-0.6119
2-6	5000 ft from HHD	69167	26566	-42601	-0.3932
2-7	10,000 ft HHD	52469	12448	-40021	-0.3694
Reach 2 average		104468	44393	-60075	-0.5545
3-1	50 ft from HHD	35268	2055	-33214	-0.9579
3-2	100 ft from HHD	46262	19359	-26903	-0.7758
3-3	200 ft from HHD	50507	34230	-16277	-0.4694
3-4	500 ft from HHD	79807	67630	-12177	-0.3512
3-5	1000 ft from HHD	109226	98209	-11017	-0.3177
3-6	5000 ft from HHD	76290	68060	-8230	-0.2374
3-7	10,000 ft HHD	81783	71881	-9901	-0.2855
Reach 3 average		68449	51632	-16817	-0.4850
Overall average		372379	239652	-132727	-0.2673

cfd = cubic feet per day.

* The low, medium, and high values of hydraulic conductivity for Material L3B-1 are (0.5, 0.5, 0.4), (1, 1, 0.8), and (5, 5, 4) ft/d.

** Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table C56. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 1 sensitivity analysis: using high K value of L3B-2.

X-section ID	Description	Run 12 vs. Run 35, High K of L3B-2*		Difference	Unit Difference**
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cft/ft
1-1	50 ft from HHD	240616	218370	-22246	-0.0636
1-2	100 ft from HHD	251057	222216	-28841	-0.0824
1-3	200 ft from HHD	274525	229626	-44899	-0.1284
1-4	500 ft from HHD	274138	228298	-45840	-0.1310
1-5	1000 ft from HHD	241274	195512	-45763	-0.1308
1-6	5000 ft from HHD	173146	132364	-40781	-0.1166
1-7	10,000 ft HHD	107891	71933	-35958	-0.1028
Reach 1 average		223235	185474	-37761	-0.1079
2-1	50 ft from HHD	84051	26139	-57912	-0.5345
2-2	100 ft from HHD	106414	42933	-63481	-0.5859
2-3	200 ft from HHD	120361	59700	-60661	-0.5599
2-4	500 ft from HHD	131998	82231	-49767	-0.4594
2-5	1000 ft from HHD	172055	125953	-46102	-0.4255
2-6	5000 ft from HHD	69862	38976	-30886	-0.2851
2-7	10,000 ft HHD	53904	25271	-28633	-0.2643
Reach 2 average		105521	57315	-48206	-0.4450
3-1	50 ft from HHD	34390	7999	-26391	-0.7611
3-2	100 ft from HHD	44818	32403	-12415	-0.3580
3-3	200 ft from HHD	49888	45858	-4031	-0.1162
3-4	500 ft from HHD	81807	79561	-2245	-0.0648
3-5	1000 ft from HHD	125265	122786	-2479	-0.0715
3-6	5000 ft from HHD	96462	94365	-2097	-0.0605
3-7	10,000 ft HHD	108999	106487	-2512	-0.0724
Reach 3 average		77376	69923	-7453	-0.2149
Overall average		401614	307488	-94126	-0.1896

cfd = cubic feet per day.

* The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1, (10, 10, 10), and (100, 100, 100) ft/d.

** Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table C57. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 1 sensitivity analysis: using low K value of L3B-2.

X-section ID	Description	Run 13 vs. Run 36, Low K of L3B-2*		Difference	Unit Difference**
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cft/ft
1-1	50 ft from HHD	210304	122141	-88163	-0.2520
1-2	100 ft from HHD	220758	124503	-96255	-0.2752
1-3	200 ft from HHD	245635	138969	-106666	-0.3049
1-4	500 ft from HHD	248949	149290	-99659	-0.2849
1-5	1000 ft from HHD	215642	133000	-82642	-0.2363
1-6	5000 ft from HHD	155914	96070	-59844	-0.1711
1-7	10,000 ft HHD	99023	54110	-44913	-0.1284
Reach 1 average		199461	116869	-82592	-0.2361
2-1	50 ft from HHD	81641	32037	-49604	-0.4579
2-2	100 ft from HHD	105759	36668	-69091	-0.6377
2-3	200 ft from HHD	120958	39159	-81799	-0.7550
2-4	500 ft from HHD	133248	50649	-82600	-0.7624
2-5	1000 ft from HHD	171575	84794	-86780	-0.8010
2-6	5000 ft from HHD	69580	14856	-54723	-0.5051
2-7	10,000 ft HHD	52036	-553	-52589	-0.4854
Reach 2 average		104971	36801	-68170	-0.6292
3-1	50 ft from HHD	36555	-3128	-39682	-1.1444
3-2	100 ft from HHD	48207	2339	-45868	-1.3228
3-3	200 ft from HHD	52378	16391	-35987	-1.0378
3-4	500 ft from HHD	80190	49384	-30806	-0.8884
3-5	1000 ft from HHD	107711	78866	-28845	-0.8319
3-6	5000 ft from HHD	73735	53790	-19945	-0.5752
3-7	10,000 ft HHD	78948	55436	-23512	-0.6781
Reach 3 average		68246	36154	-32092	-0.9255
Overall average		371149	187070	-184079	-0.3710

cfd = cubic feet per day.

* The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1, (10, 10, 10), and (100, 100, 100) ft/d.

** Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table C58. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 1 sensitivity analysis: using high K value of L4.

X-section ID	Description	Run 14 vs. Run 37, High K of L4*		Difference	Unit Difference**
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cft/ft
1-1	50 ft from HHD	217721	175685	-42036	-0.1202
1-2	100 ft from HHD	228637	179663	-48974	-0.1400
1-3	200 ft from HHD	251685	190348	-61337	-0.1753
1-4	500 ft from HHD	254905	197437	-57467	-0.1643
1-5	1000 ft from HHD	225721	174148	-51573	-0.1474
1-6	5000 ft from HHD	159929	116001	-43928	-0.1256
1-7	10,000 ft HHD	100636	63566	-37070	-0.1060
Reach 1 average		205605	156693	-48912	-0.1398
2-1	50 ft from HHD	86490	34513	-51977	-0.4798
2-2	100 ft from HHD	109535	43563	-65972	-0.6089
2-3	200 ft from HHD	122361	51198	-71162	-0.6568
2-4	500 ft from HHD	133328	70625	-62703	-0.5788
2-5	1000 ft from HHD	173419	114104	-59315	-0.5475
2-6	5000 ft from HHD	71980	28569	-43411	-0.4007
2-7	10,000 ft HHD	54018	12205	-41813	-0.3859
Reach 2 average		107304	50683	-56622	-0.5226
3-1	50 ft from HHD	34703	-1180	-35884	-1.0349
3-2	100 ft from HHD	45171	15095	-30076	-0.8674
3-3	200 ft from HHD	49405	33388	-16017	-0.4619
3-4	500 ft from HHD	79274	69438	-9836	-0.2837
3-5	1000 ft from HHD	112445	104367	-8079	-0.2330
3-6	5000 ft from HHD	82109	75329	-6780	-0.1955
3-7	10,000 ft HHD	89782	81475	-8307	-0.2396
Reach 3 average		70413	53987	-16425	-0.4737
Overall average		380555	257436	-123119	-0.2475

cfd = cubic feet per day.

* The low, medium, and high values of hydraulic conductivity for Material L4 are (5, 5, 0.5), (10, 10, 1), and (30, 30, 3) ft/d.

** Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table C59. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 1 sensitivity analysis: using low K value of L4.

X-section ID	Description	Run 15 vs. Run 38, Low K of L4*		Difference	Unit Difference**
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cft/ft
1-1	50 ft from HHD	212147	164409	-47738	-0.1365
1-2	100 ft from HHD	222372	169215	-53157	-0.1520
1-3	200 ft from HHD	247113	178356	-68757	-0.1966
1-4	500 ft from HHD	249539	182500	-67039	-0.1916
1-5	1000 ft from HHD	216368	155660	-60709	-0.1735
1-6	5000 ft from HHD	156565	108490	-48075	-0.1374
1-7	10,000 ft HHD	99233	60153	-39080	-0.1117
Reach 1 average		200477	145540	-54936	-0.1570
2-1	50 ft from HHD	80548	23773	-56775	-0.5240
2-2	100 ft from HHD	104308	36900	-67408	-0.6222
2-3	200 ft from HHD	119420	48811	-70609	-0.6517
2-4	500 ft from HHD	131771	66757	-65014	-0.6001
2-5	1000 ft from HHD	169988	104360	-65629	-0.6058
2-6	5000 ft from HHD	68392	27111	-41281	-0.3810
2-7	10,000 ft HHD	51615	12986	-38629	-0.3566
Reach 2 average		103720	45814	-57906	-0.5345
3-1	50 ft from HHD	35930	4045	-31885	-0.9195
3-2	100 ft from HHD	47377	22570	-24806	-0.7154
3-3	200 ft from HHD	51743	35511	-16231	-0.4681
3-4	500 ft from HHD	80221	66735	-13486	-0.3889
3-5	1000 ft from HHD	108420	95420	-13000	-0.3749
3-6	5000 ft from HHD	74479	65205	-9274	-0.2674
3-7	10,000 ft HHD	79717	68787	-10930	-0.3152
Reach 3 average		68269	51182	-17088	-0.4928
Overall average		370831	240021	-130810	-0.2636

cfd = cubic feet per day.

* The low, medium, and high values of hydraulic conductivity for Material L4 are (5, 5, 0.5), (10, 10, 1), and (30, 30, 3) ft/d.

** Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table C60. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 1 sensitivity analysis: using high K value of L5.

X-section ID	Description	Run 16 vs. Run 39, High K of L5*		Difference	Unit Difference**
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cft/ft
1-1	50 ft from HHD	220533	170959	-49574	-0.1417
1-2	100 ft from HHD	231952	174956	-56997	-0.1629
1-3	200 ft from HHD	258889	185596	-73293	-0.2095
1-4	500 ft from HHD	259281	189115	-70167	-0.2006
1-5	1000 ft from HHD	226193	162317	-63876	-0.1826
1-6	5000 ft from HHD	165063	112409	-52653	-0.1505
1-7	10,000 ft HHD	104533	61255	-43279	-0.1237
Reach 1 average		209492	150944	-58548	-0.1674
2-1	50 ft from HHD	86894	26723	-60171	-0.5554
2-2	100 ft from HHD	110644	38231	-72413	-0.6684
2-3	200 ft from HHD	124004	48031	-75973	-0.7012
2-4	500 ft from HHD	132880	64719	-68161	-0.6291
2-5	1000 ft from HHD	169197	102878	-66319	-0.6121
2-6	5000 ft from HHD	68365	24870	-43495	-0.4015
2-7	10,000 ft HHD	52807	11191	-41616	-0.3841
Reach 2 average		106399	45235	-61164	-0.5646
3-1	50 ft from HHD	36633	2488	-34145	-0.9847
3-2	100 ft from HHD	47019	18577	-28443	-0.8203
3-3	200 ft from HHD	48644	31060	-17584	-0.5071
3-4	500 ft from HHD	73791	61141	-12650	-0.3648
3-5	1000 ft from HHD	115293	104164	-11129	-0.3210
3-6	5000 ft from HHD	86164	78166	-7998	-0.2307
3-7	10,000 ft HHD	102232	91187	-11045	-0.3185
Reach 3 average		72825	55255	-17571	-0.5067
Overall average		384515	246300	-138215	-0.2786

cfd = cubic feet per day.

* The low, medium, and high values of hydraulic conductivity for Material L5 are (150, 150, 12), (400, 400, 32), and (750, 750, 60) ft/d.

** Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table C61. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 1 sensitivity analysis: using low K value of L5.

X-section ID	Description	Run 17 vs. Run 40, Low K of L5*		Difference	Unit Difference**
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cft/ft
1-1	50 ft from HHD	207092	164505	-42587	-0.1217
1-2	100 ft from HHD	215861	168780	-47081	-0.1346
1-3	200 ft from HHD	235211	177396	-57815	-0.1653
1-4	500 ft from HHD	236977	181632	-55345	-0.1582
1-5	1000 ft from HHD	206623	158032	-48591	-0.1389
1-6	5000 ft from HHD	147715	108686	-39028	-0.1116
1-7	10,000 ft HHD	93680	61030	-32651	-0.0933
Reach 1 average		191880	145723	-46157	-0.1319
2-1	50 ft from HHD	71902	24091	-47811	-0.4413
2-2	100 ft from HHD	95279	35970	-59309	-0.5474
2-3	200 ft from HHD	111051	47605	-63446	-0.5856
2-4	500 ft from HHD	126620	68710	-57911	-0.5345
2-5	1000 ft from HHD	167276	109043	-58233	-0.5375
2-6	5000 ft from HHD	67863	27575	-40288	-0.3719
2-7	10,000 ft HHD	52344	14326	-38018	-0.3509
Reach 2 average		98905	46760	-52145	-0.4813
3-1	50 ft from HHD	34672	1904	-32768	-0.9450
3-2	100 ft from HHD	46514	21183	-25331	-0.7305
3-3	200 ft from HHD	53311	38499	-14812	-0.4272
3-4	500 ft from HHD	85848	74024	-11825	-0.3410
3-5	1000 ft from HHD	105790	94523	-11267	-0.3249
3-6	5000 ft from HHD	69329	60516	-8813	-0.2542
3-7	10,000 ft HHD	64929	56077	-8852	-0.2553
Reach 3 average		65770	49532	-16238	-0.4683
Overall average		356676	241080	-115595	-0.2324

cfd = cubic feet per day.

* The low, medium, and high values of hydraulic conductivity for Material L5 are (150, 150, 12), (400, 400, 32), and (750, 750, 60) ft/d.

** Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table C62. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 1 sensitivity analysis: using high K value of L6.

X-section ID	Description	Run 18 vs. Run 41, High K of L6*		Difference	Unit Difference**
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cft/ft
1-1	50 ft from HHD	213317	166746	-46571	-0.1331
1-2	100 ft from HHD	223694	170864	-52830	-0.1510
1-3	200 ft from HHD	248059	181334	-66725	-0.1907
1-4	500 ft from HHD	250382	186406	-63977	-0.1829
1-5	1000 ft from HHD	219210	161688	-57522	-0.1644
1-6	5000 ft from HHD	157356	110429	-46928	-0.1342
1-7	10,000 ft HHD	99515	60631	-38884	-0.1112
Reach 1 average		201648	148300	-53348	-0.1525
2-1	50 ft from HHD	82590	27609	-54981	-0.5075
2-2	100 ft from HHD	106002	39340	-66662	-0.6153
2-3	200 ft from HHD	120240	49832	-70408	-0.6499
2-4	500 ft from HHD	132027	68557	-63470	-0.5858
2-5	1000 ft from HHD	170962	108426	-62535	-0.5772
2-6	5000 ft from HHD	69312	27401	-41912	-0.3869
2-7	10,000 ft HHD	52565	12800	-39764	-0.3670
Reach 2 average		104814	47709	-57105	-0.5271
3-1	50 ft from HHD	35268	2054	-33214	-0.9579
3-2	100 ft from HHD	46262	19327	-26935	-0.7768
3-3	200 ft from HHD	50507	34165	-16342	-0.4713
3-4	500 ft from HHD	79807	67527	-12280	-0.3541
3-5	1000 ft from HHD	109226	98164	-11062	-0.3190
3-6	5000 ft from HHD	76290	68069	-8222	-0.2371
3-7	10,000 ft HHD	81783	71952	-9831	-0.2835
Reach 3 average		83422	58424	-24999	-0.7209
Overall average		375145	245684	-129460	-0.2748

cfd = cubic feet per day.

* The low, medium, and high values of hydraulic conductivity for Material L6 are (10, 10, 5), (35, 35, 17.5), and (35, 35, 17.5) ft/d.

** Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table C63. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 1 sensitivity analysis: using low K value of L6.

X-section ID	Description	Run 19 vs. Run 42, Low K of L6*		Difference	Unit Difference**
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cft/ft
1-1	50 ft from HHD	213504	166240	-47264	-0.1351
1-2	100 ft from HHD	223907	170671	-53236	-0.1522
1-3	200 ft from HHD	248860	181856	-67004	-0.1915
1-4	500 ft from HHD	251645	187076	-64569	-0.1846
1-5	1000 ft from HHD	220696	162045	-58651	-0.1677
1-6	5000 ft from HHD	156939	109103	-47836	-0.1367
1-7	10,000 ft HHD	99052	59789	-39263	-0.1122
Reach 1 average		202086	148111	-53975	-0.1543
2-1	50 ft from HHD	83260	28058	-55201	-0.5095
2-2	100 ft from HHD	106773	40030	-66743	-0.6160
2-3	200 ft from HHD	121089	50735	-70354	-0.6494
2-4	500 ft from HHD	133162	69892	-63270	-0.5840
2-5	1000 ft from HHD	172589	110141	-62447	-0.5764
2-6	5000 ft from HHD	70012	28159	-41853	-0.3863
2-7	10,000 ft HHD	53097	13404	-39693	-0.3664
Reach 2 average		105712	48631	-57080	-0.5269
3-1	50 ft from HHD	35331	2085	-33246	-0.9588
3-2	100 ft from HHD	46458	19812	-26646	-0.7684
3-3	200 ft from HHD	50991	34963	-16028	-0.4622
3-4	500 ft from HHD	80968	68766	-12202	-0.3519
3-5	1000 ft from HHD	108806	97491	-11314	-0.3263
3-6	5000 ft from HHD	74644	66011	-8633	-0.2490
3-7	10,000 ft HHD	77334	67026	-10308	-0.2973
Reach 3 average		82892	57826	-25065	-0.7229
Overall average		376382	246308	-130074	-0.2762

cfd = cubic feet per day.

* The low, medium, and high values of hydraulic conductivity for Material L6 are (10, 10, 5), (35, 35, 17.5), and (35, 35, 17.5) ft/d.

** Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table C64. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 1 sensitivity analysis: using high K value of L7-1.

X-section ID	Description	Run 20 vs. Run 43, High K of L7-1*		Difference	Unit Difference**
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cft/ft
1-1	50 ft from HHD	213269	166797	-46473	-0.1329
1-2	100 ft from HHD	223561	170911	-52650	-0.1505
1-3	200 ft from HHD	247652	181195	-66457	-0.1900
1-4	500 ft from HHD	249706	186001	-63705	-0.1821
1-5	1000 ft from HHD	217998	160766	-57232	-0.1636
1-6	5000 ft from HHD	156950	110290	-46660	-0.1334
1-7	10,000 ft HHD	99203	60559	-38644	-0.1105
Reach 1 average		201191	148074	-53117	-0.1518
2-1	50 ft from HHD	81378	26687	-54691	-0.5048
2-2	100 ft from HHD	104793	38380	-66413	-0.6130
2-3	200 ft from HHD	119076	48860	-70216	-0.6481
2-4	500 ft from HHD	130947	67588	-63360	-0.5848
2-5	1000 ft from HHD	169849	107393	-62456	-0.5765
2-6	5000 ft from HHD	68507	26618	-41889	-0.3866
2-7	10,000 ft HHD	52029	12283	-39745	-0.3669
Reach 2 average		103797	46830	-56967	-0.5258
3-1	50 ft from HHD	35268	2054	-33214	-0.9579
3-2	100 ft from HHD	46262	19327	-26935	-0.7768
3-3	200 ft from HHD	50506	34165	-16342	-0.4713
3-4	500 ft from HHD	79807	67527	-12280	-0.3541
3-5	1000 ft from HHD	109226	98164	-11062	-0.3190
3-6	5000 ft from HHD	76290	68069	-8222	-0.2371
3-7	10,000 ft HHD	81783	71952	-9831	-0.2835
Reach 3 average		68449	51608	-16841	-0.4857
Overall average		371532	243606	-127927	-0.2575

cfd = cubic feet per day.

* The low, medium, and high values of hydraulic conductivity for Material L7-1 are (200, 200, 20), (500, 500, 50), and (1375, 1375, 137.5) ft/d.

** Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table C65. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 1 sensitivity analysis: using low K value of L7-1.

X-section ID	Description	Run 21 vs. Run 44, Low K of L7-1*		Difference	Unit Difference**
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cft/ft
1-1	50 ft from HHD	213392	166843	-46549	-0.1331
1-2	100 ft from HHD	223901	170974	-52927	-0.1513
1-3	200 ft from HHD	248688	181726	-66962	-0.1914
1-4	500 ft from HHD	251422	187185	-64238	-0.1836
1-5	1000 ft from HHD	220975	163179	-57796	-0.1652
1-6	5000 ft from HHD	157986	110703	-47282	-0.1352
1-7	10,000 ft HHD	99997	60765	-39232	-0.1122
Reach 1 average		202337	148768	-53569	-0.1531
2-1	50 ft from HHD	84355	28980	-55374	-0.5111
2-2	100 ft from HHD	107760	40784	-66977	-0.6182
2-3	200 ft from HHD	121930	51314	-70616	-0.6518
2-4	500 ft from HHD	133585	70069	-63516	-0.5863
2-5	1000 ft from HHD	172573	110086	-62486	-0.5768
2-6	5000 ft from HHD	70448	28574	-41874	-0.3865
2-7	10,000 ft HHD	53290	13570	-39720	-0.3666
Reach 2 average		106277	49054	-57223	-0.5282
3-1	50 ft from HHD	35269	2055	-33214	-0.9579
3-2	100 ft from HHD	46262	19359	-26903	-0.7759
3-3	200 ft from HHD	50507	34230	-16277	-0.4694
3-4	500 ft from HHD	79807	67630	-12177	-0.3512
3-5	1000 ft from HHD	109227	98210	-11017	-0.3177
3-6	5000 ft from HHD	76291	68061	-8230	-0.2374
3-7	10,000 ft HHD	81783	71881	-9901	-0.2856
Reach 3 average		68449	51632	-16817	-0.4850
Overall average		375159	246561	-128598	-0.2589

cfd = cubic feet per day.

* The low, medium, and high values of hydraulic conductivity for Material L7-1 are (200, 200, 20), (500, 500, 50), and (1375, 1375, 137.5) ft/d.

** Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table C66. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 1 sensitivity analysis: using high K value of L7-2.

X-section ID	Description	Run 22 vs. Run 45, High K of L7-2*		Difference	Unit Difference**
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cft/ft
1-1	50 ft from HHD	213224	166651	-46573	-0.1331
1-2	100 ft from HHD	223586	170739	-52847	-0.1511
1-3	200 ft from HHD	247894	181087	-66806	-0.1910
1-4	500 ft from HHD	250196	186178	-64018	-0.1830
1-5	1000 ft from HHD	218975	161445	-57530	-0.1645
1-6	5000 ft from HHD	157233	110259	-46974	-0.1343
1-7	10,000 ft HHD	99434	60527	-38907	-0.1112
Reach 1 average		201506	148127	-53379	-0.1526
2-1	50 ft from HHD	82444	27438	-55006	-0.5077
2-2	100 ft from HHD	105861	39155	-66706	-0.6157
2-3	200 ft from HHD	120109	49655	-70455	-0.6503
2-4	500 ft from HHD	131905	68396	-63509	-0.5862
2-5	1000 ft from HHD	170823	108297	-62525	-0.5771
2-6	5000 ft from HHD	69237	27356	-41881	-0.3866
2-7	10,000 ft HHD	52508	12748	-39760	-0.3670
Reach 2 average		104698	47578	-57120	-0.5272
3-1	50 ft from HHD	35276	2055	-33221	-0.9581
3-2	100 ft from HHD	46267	19319	-26948	-0.7772
3-3	200 ft from HHD	50502	34150	-16352	-0.4716
3-4	500 ft from HHD	79782	67499	-12282	-0.3542
3-5	1000 ft from HHD	109233	98176	-11057	-0.3189
3-6	5000 ft from HHD	76367	68150	-8217	-0.2370
3-7	10,000 ft HHD	81957	72123	-9834	-0.2836
Reach 3 average		68483	51639	-16845	-0.4858
Overall average		372763	244417	-128346	-0.2584

cfd = cubic feet per day.

* The low, medium, and high values of hydraulic conductivity for Material L7-2 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d.

** Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table C67. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 1 sensitivity analysis: using low K value of L7-2.

X-section ID	Description	Run 23 vs. Run 46, Low K of L7-2*		Difference	Unit Difference**
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cft/ft
1-1	50 ft from HHD	213343	166949	-46395	-0.1326
1-2	100 ft from HHD	223724	171083	-52641	-0.1505
1-3	200 ft from HHD	248106	181583	-66523	-0.1902
1-4	500 ft from HHD	250436	186635	-63801	-0.1824
1-5	1000 ft from HHD	219280	161883	-57397	-0.1641
1-6	5000 ft from HHD	157392	110538	-46854	-0.1339
1-7	10,000 ft HHD	99538	60686	-38852	-0.1111
Reach 1 average		201688	148480	-53209	-0.1521
2-1	50 ft from HHD	82634	27663	-54971	-0.5074
2-2	100 ft from HHD	106044	39412	-66633	-0.6150
2-3	200 ft from HHD	120280	49920	-70360	-0.6494
2-4	500 ft from HHD	132064	68675	-63389	-0.5851
2-5	1000 ft from HHD	171004	108583	-62421	-0.5762
2-6	5000 ft from HHD	69336	27435	-41901	-0.3868
2-7	10,000 ft HHD	52583	12833	-39749	-0.3669
Reach 2 average		104849	47789	-57061	-0.5267
3-1	50 ft from HHD	35266	2055	-33212	-0.9578
3-2	100 ft from HHD	46260	19361	-26899	-0.7757
3-3	200 ft from HHD	50508	34234	-16274	-0.4693
3-4	500 ft from HHD	79814	67637	-12177	-0.3512
3-5	1000 ft from HHD	109224	98206	-11019	-0.3178
3-6	5000 ft from HHD	76269	68037	-8232	-0.2374
3-7	10,000 ft HHD	81733	71833	-9900	-0.2855
Reach 3 average		68439	51623	-16816	-0.4850
Overall average		373078	245004	-128073	-0.2579

cfd = cubic feet per day.

* The low, medium, and high values of hydraulic conductivity for Material L7-2 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d.

** Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

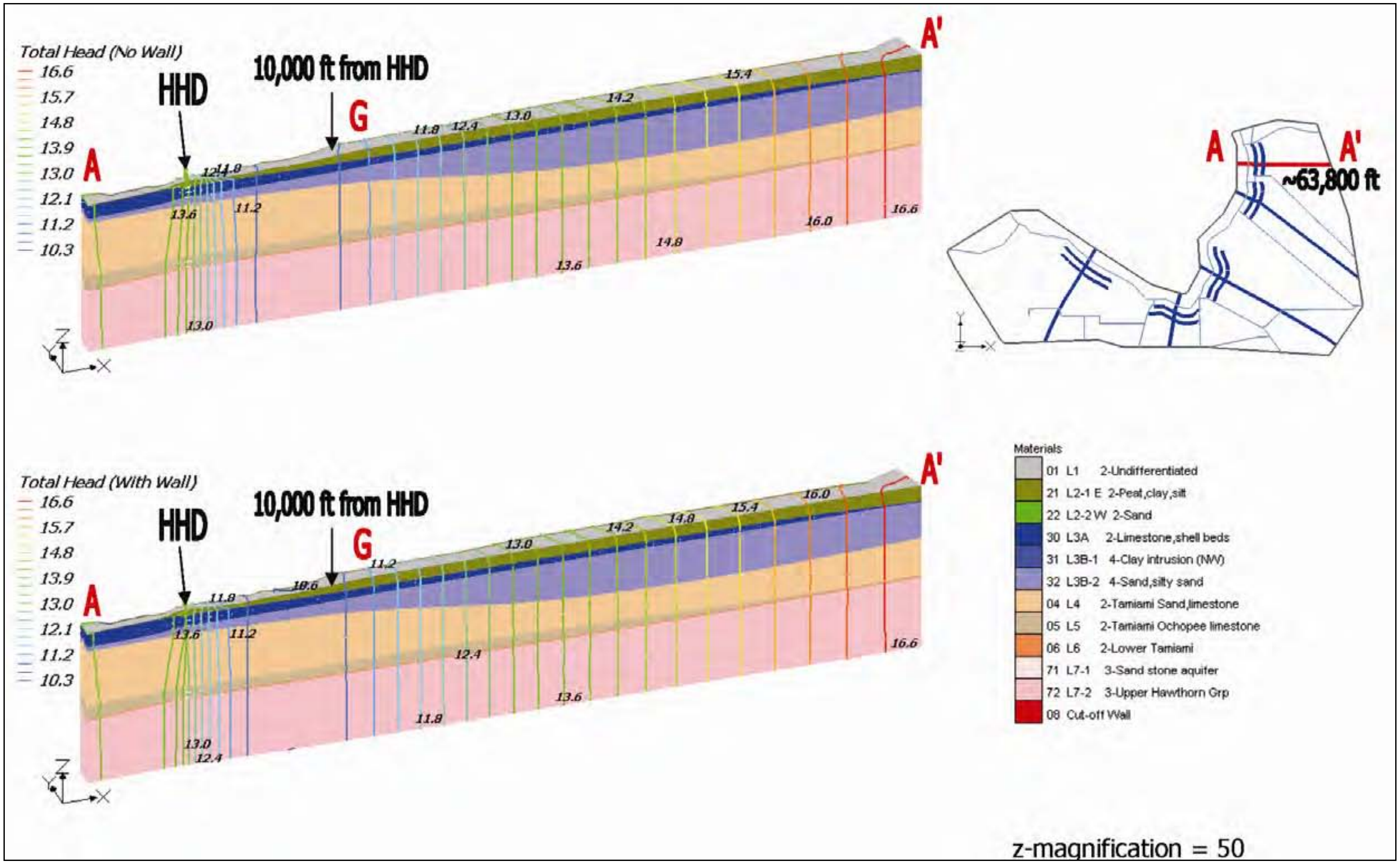


Figure C1. Stage 1 base case total head comparison (linear color contour lines) between "without project" (Run 1, upper left) and "with project" (Run 24, lower left) on Cross Section X1A-P.

Figure C2. Stage 1 base case total head comparison (linear color contour lines) between "without project" (Run 1, upper left) and "with project" (Run 24, lower left) on Cross Section X1A-5K.

Figure C3. Stage 1 base case total head comparison (linear color contour lines) between "without project" (Run 1, upper left) and "with project" (Run 24, lower left) on Cross Section X1A-10K.

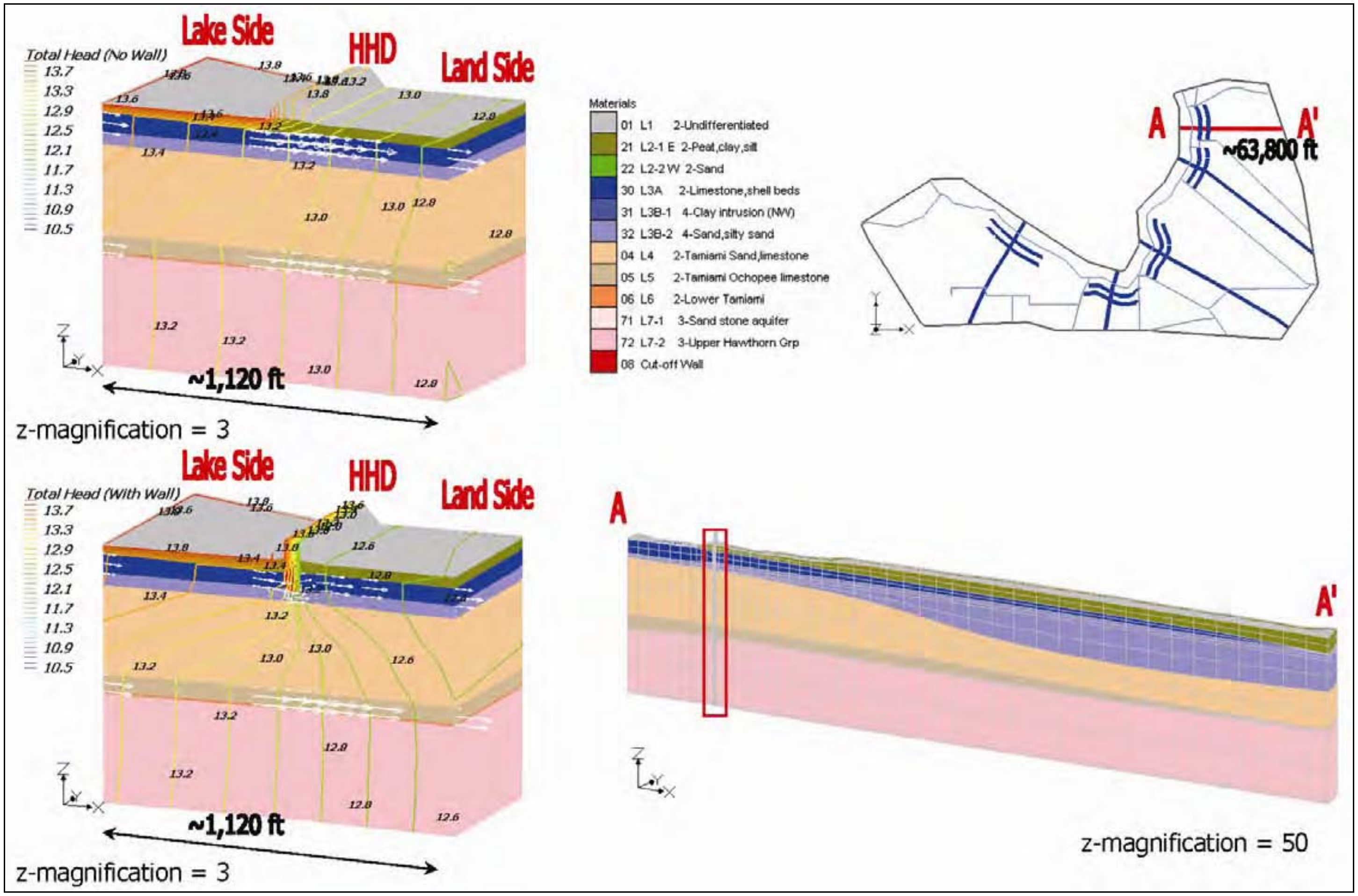


Figure C4. Stage 1 base case zoom-in comparison 1 in the vicinity of HHD between "without project" (Run 1, upper left) and "with project" (Run 24, lower left) on Cross Section X1A-P: total head (linear color contour lines); scaled velocity (light blue arrows).

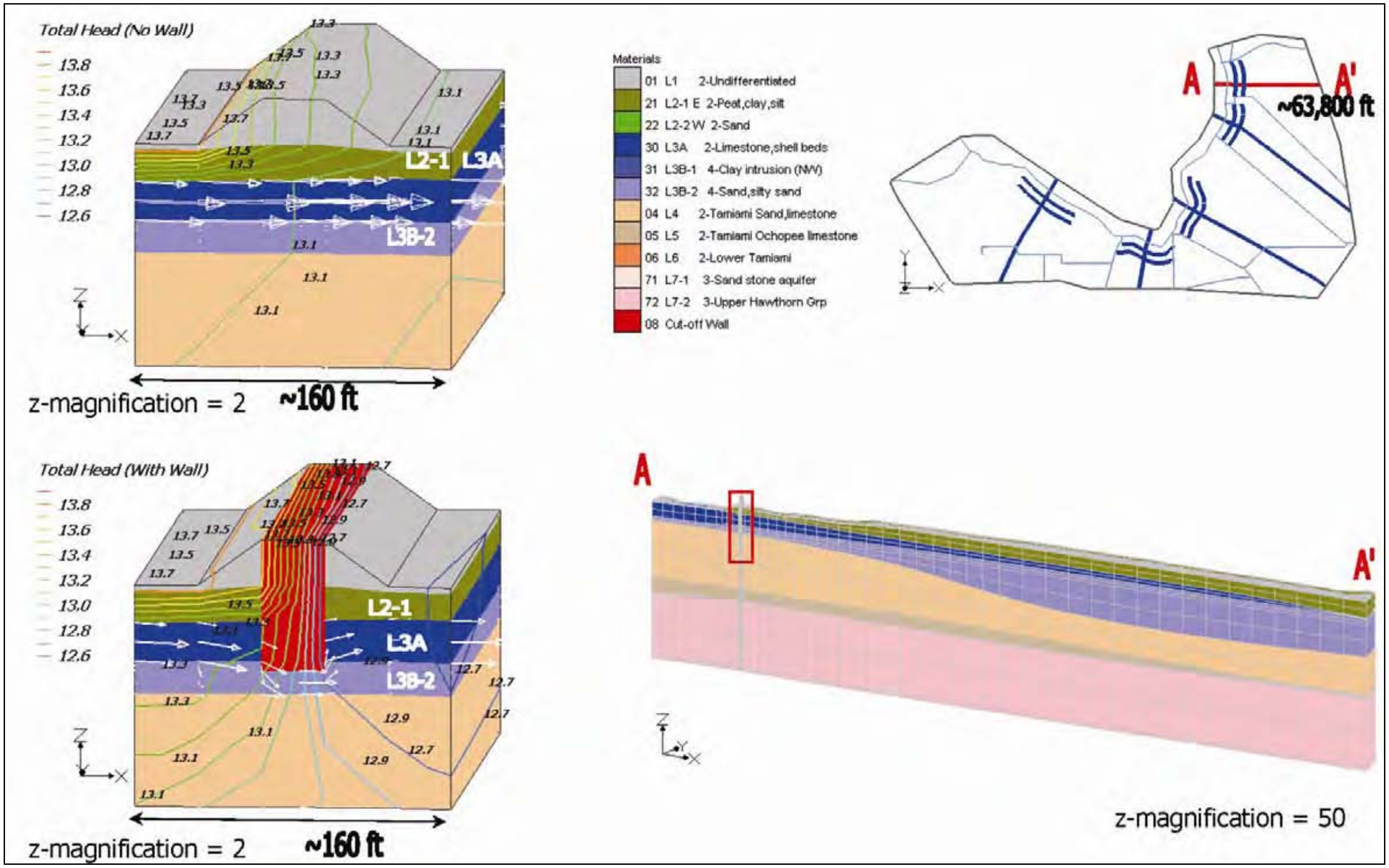


Figure C5. Stage 1 base case zoom-in comparison 2 in the vicinity of HHD between "without project" (Run 1, upper left) and "with project" (Run 24, lower left) on Cross Section X1A-P: total head (linear color contour lines); scaled velocity (light blue arrows).

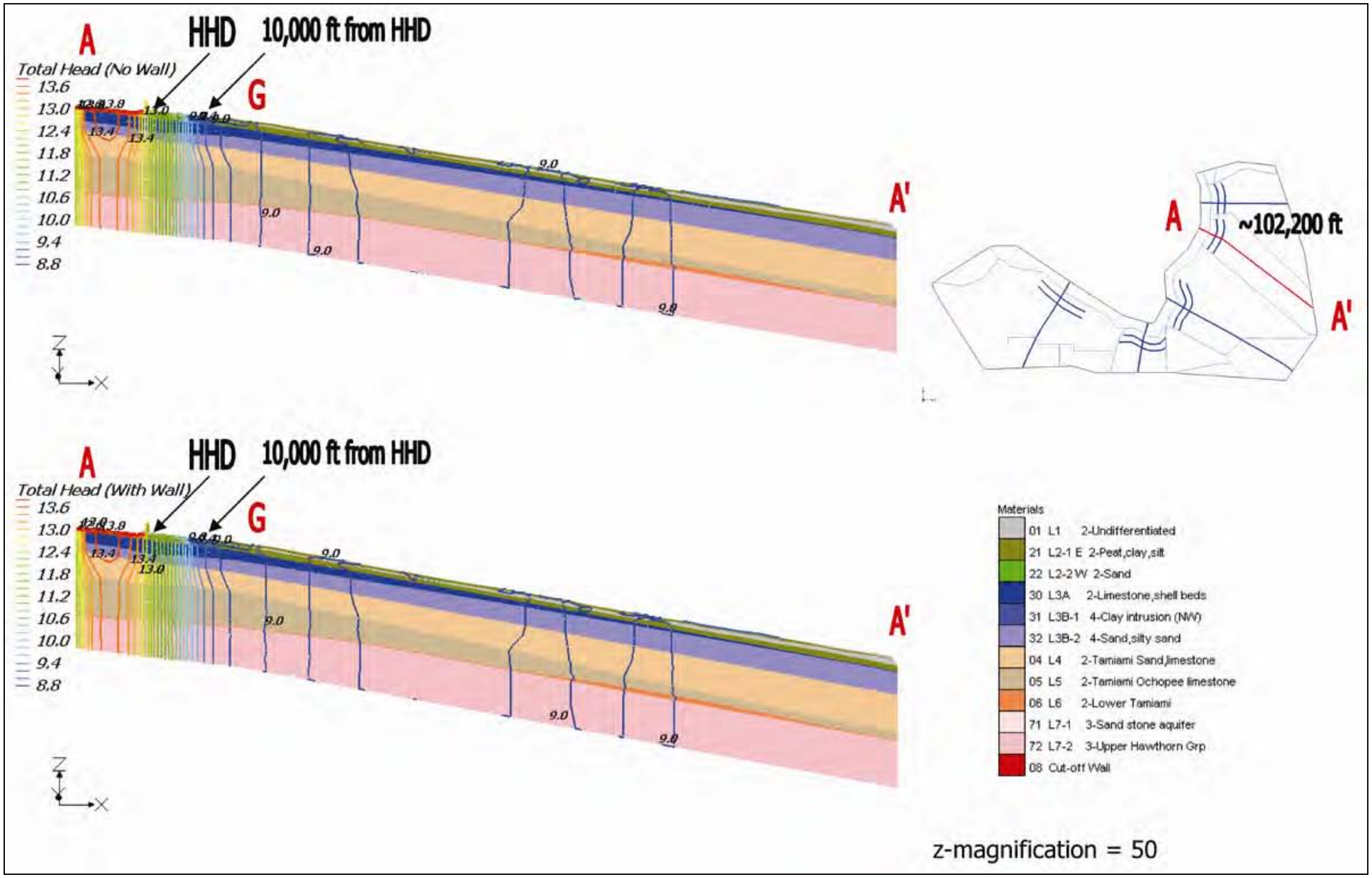


Figure C6. Stage 1 base case total head comparison (linear color contour lines) between "without project" (Run 1, upper left) and "with project" (Run 24, lower left) on Cross Section X1B-P.

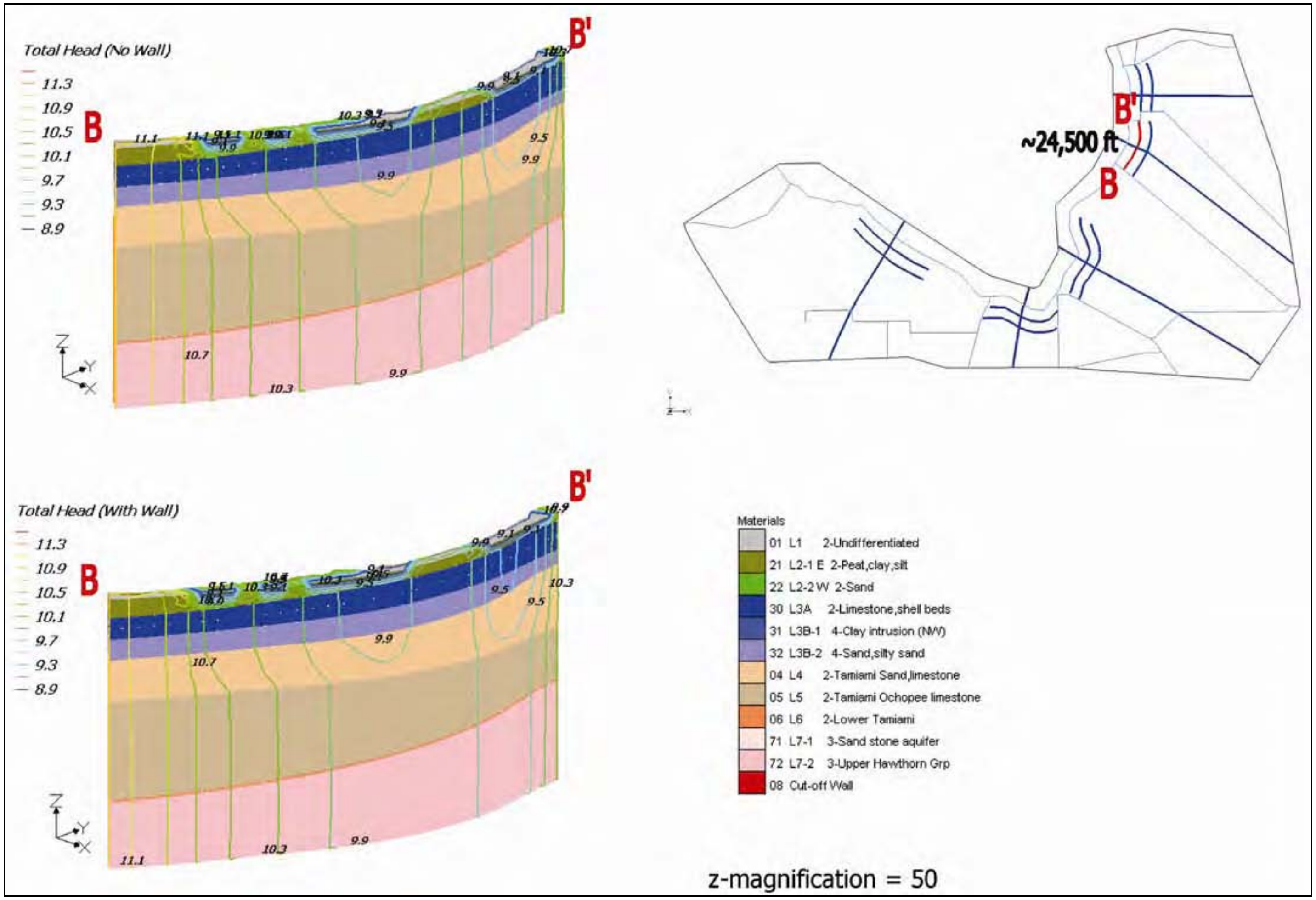


Figure C7. Stage 1 base case total head comparison (linear color contour lines) between "without project" (Run 1, upper left) and "with project" (Run 24, lower left) on Cross Section X1B-5K.

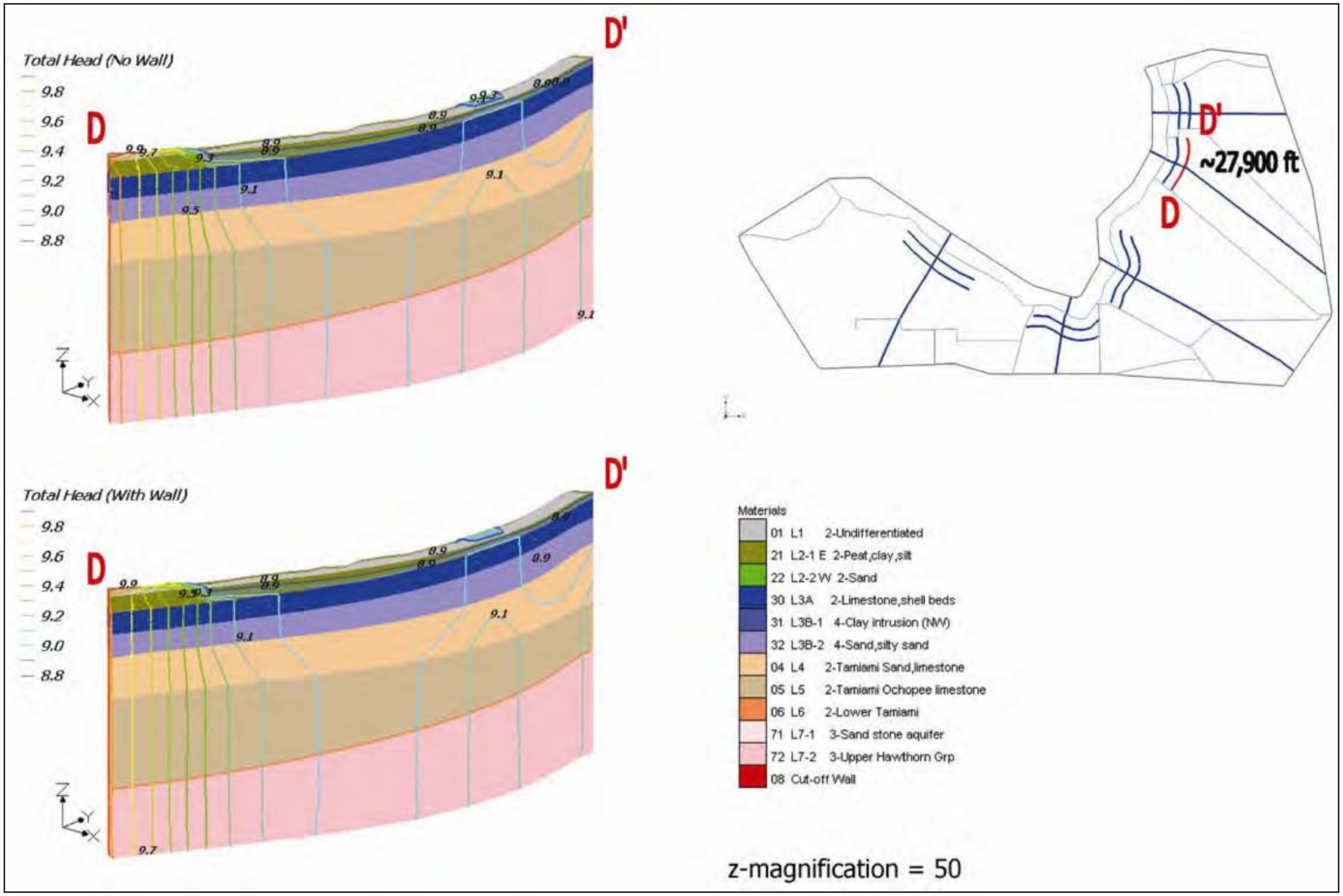


Figure C8. Stage 1 base case total head comparison (linear color contour lines) between "without project" (Run 1, upper left) and "with project" (Run 24, lower left) on Cross Section X1B-10K.

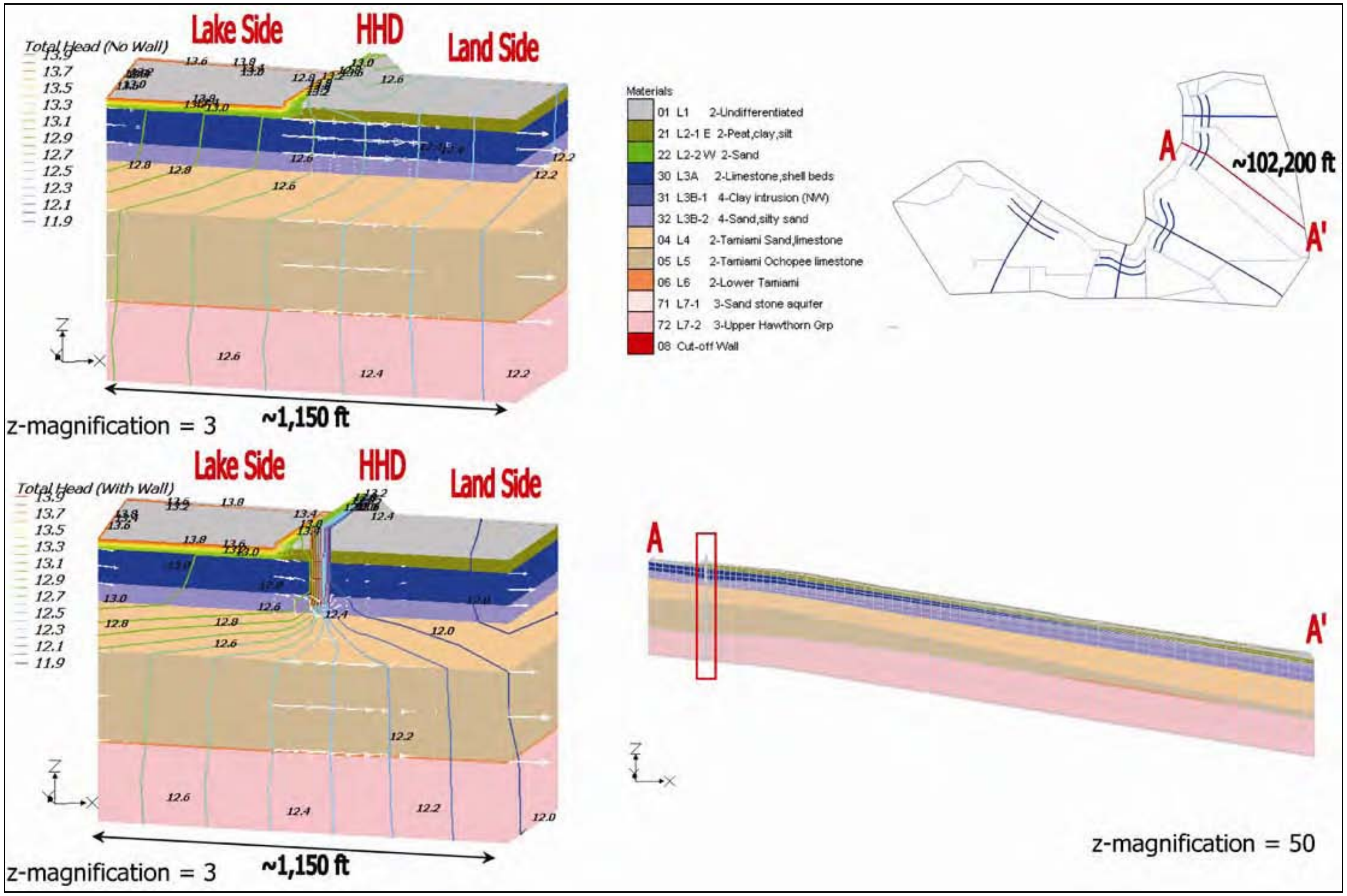


Figure C9. Stage 1 base case zoom-in comparison 1 in the vicinity of HHD between "without project" (Run 1, upper left) and "with project" (Run 24, lower left) on Cross Section X1B-P: total head (linear color contour lines); scaled velocity (light blue arrows).

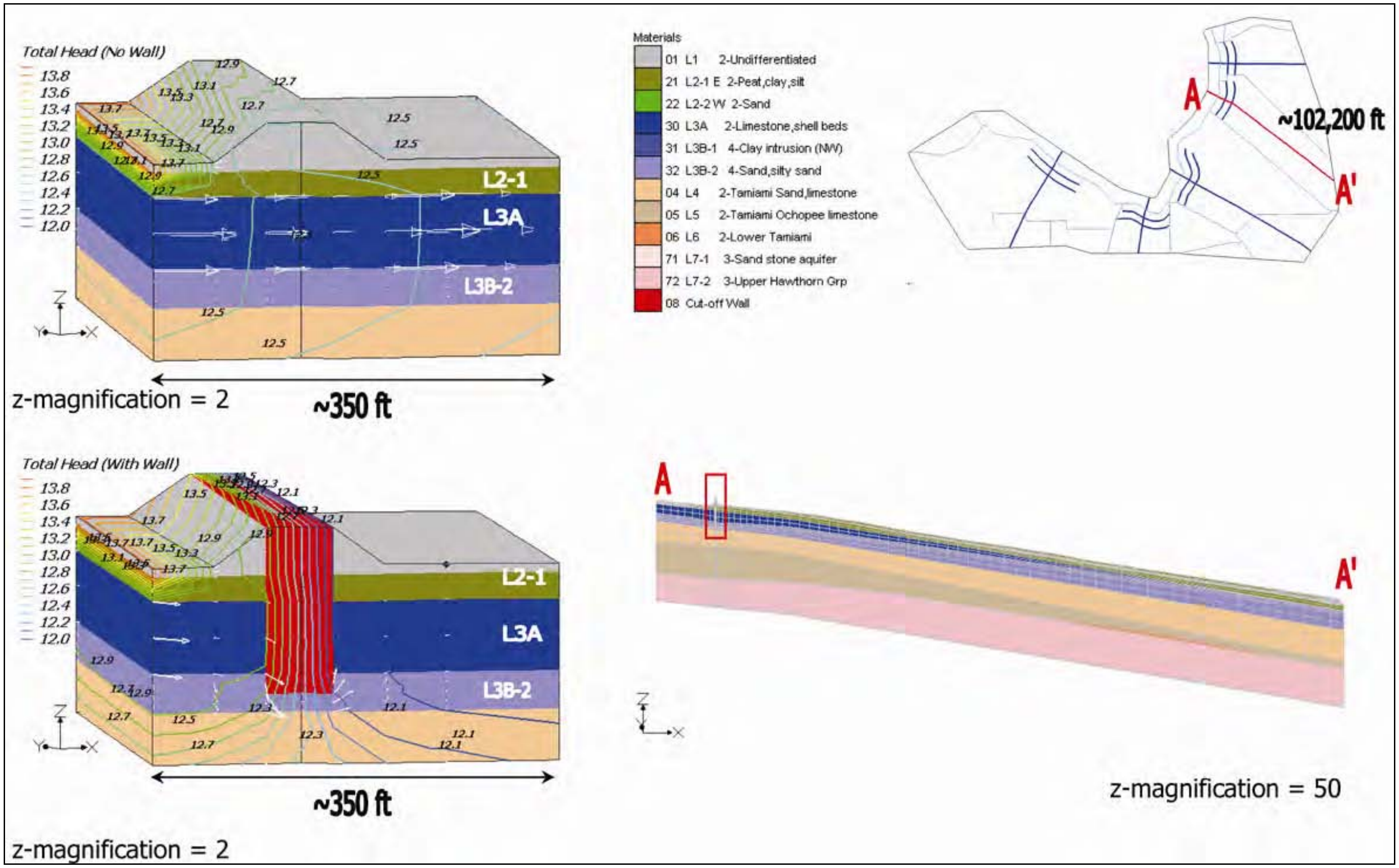


Figure C10. Stage 1 base case zoom-in comparison 2 in the vicinity of HHD between "without project" (Run 1, upper left) and "with project" (Run 24, lower left) on Cross Section X1B-P: total head (linear color contour lines); scaled velocity (light blue arrows).

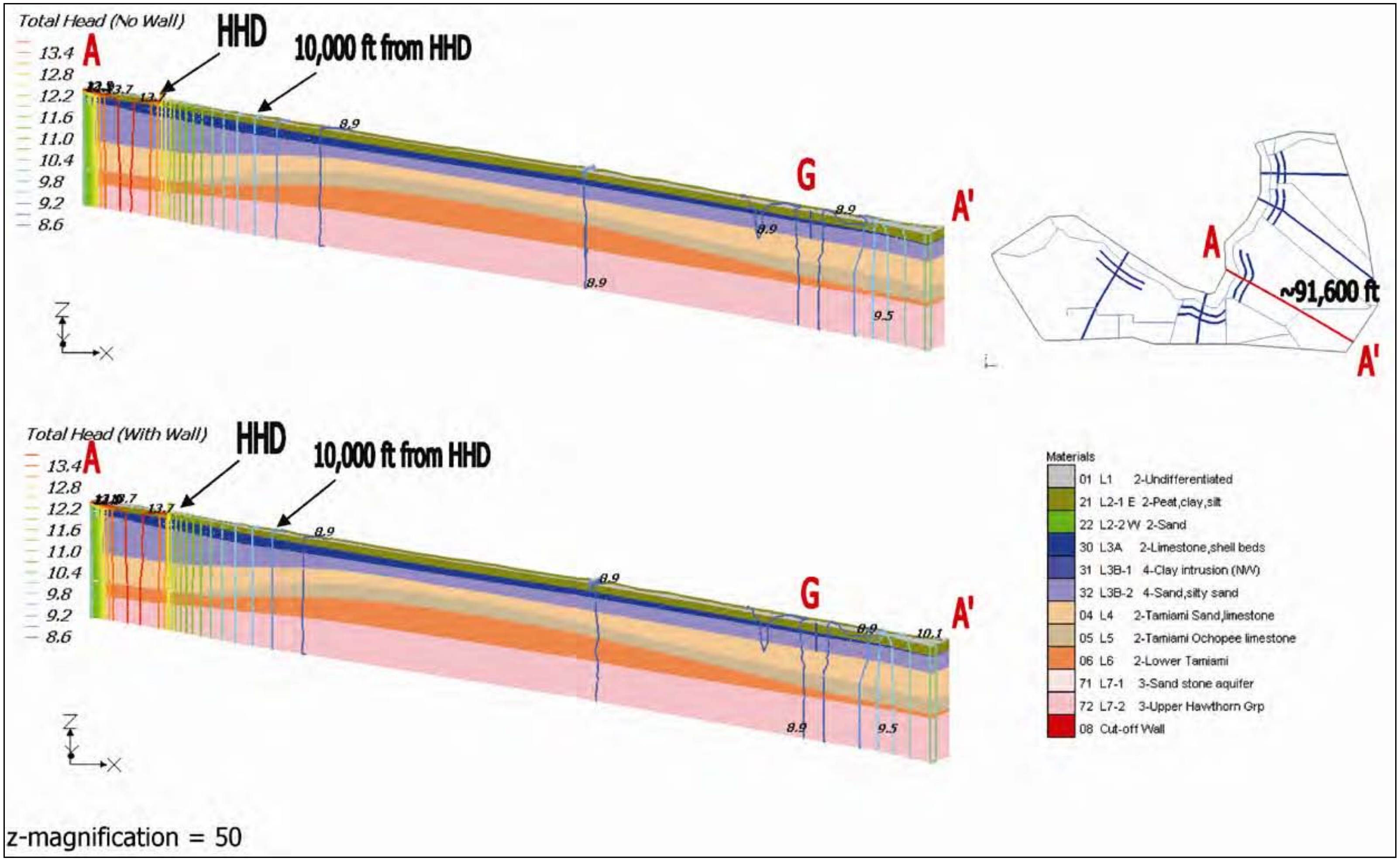


Figure C11. Stage 1 base case total head comparison (linear color contour lines) between "without project" (Run 1, upper left) and "with project" (Run 24, lower left) on Cross Section X1D-P.

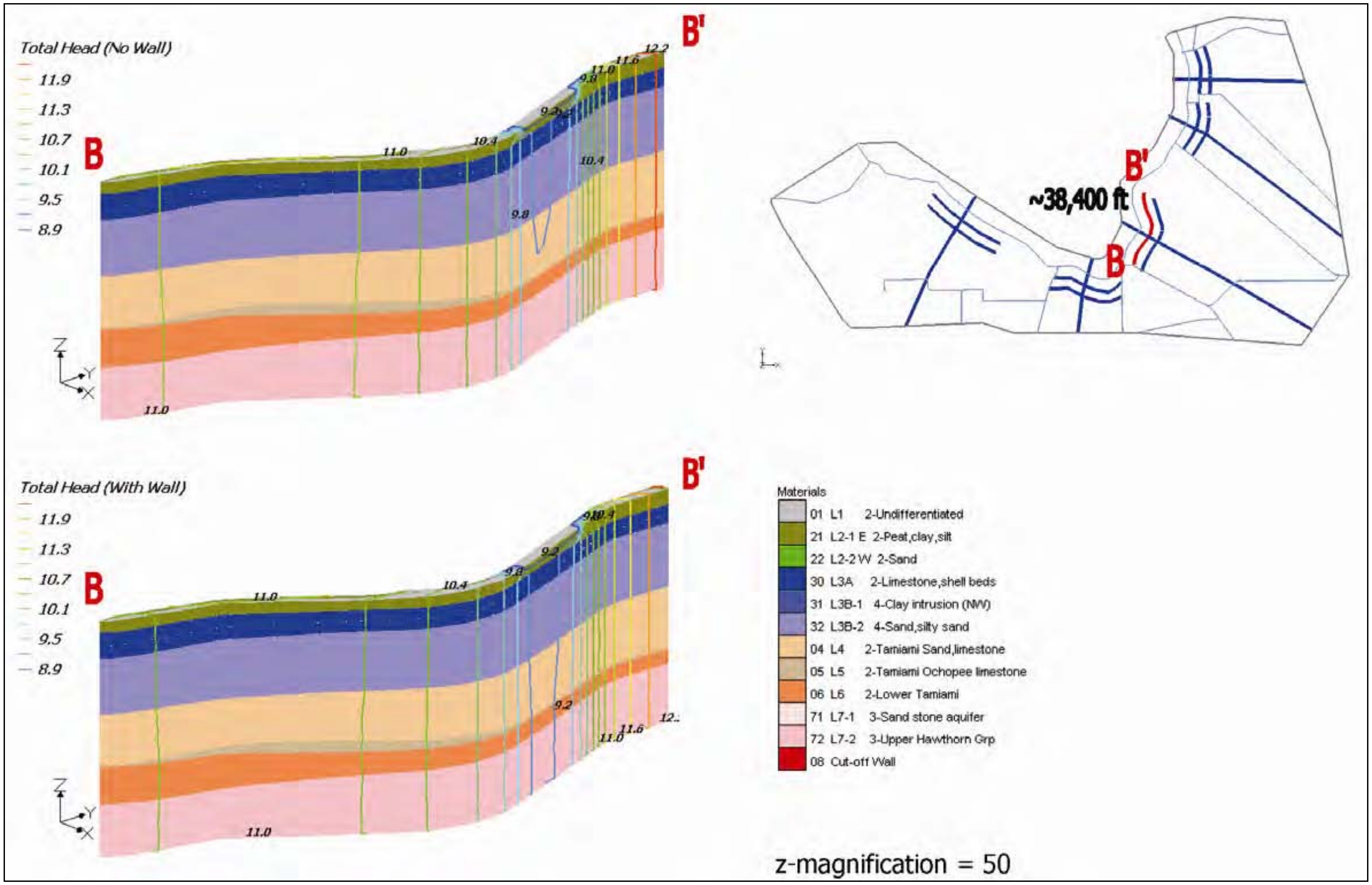


Figure C12. Stage 1 base case total head comparison (linear color contour lines) between "without project" (Run 1, upper left) and "with project" (Run 24, lower left) on Cross Section X1D-5K.

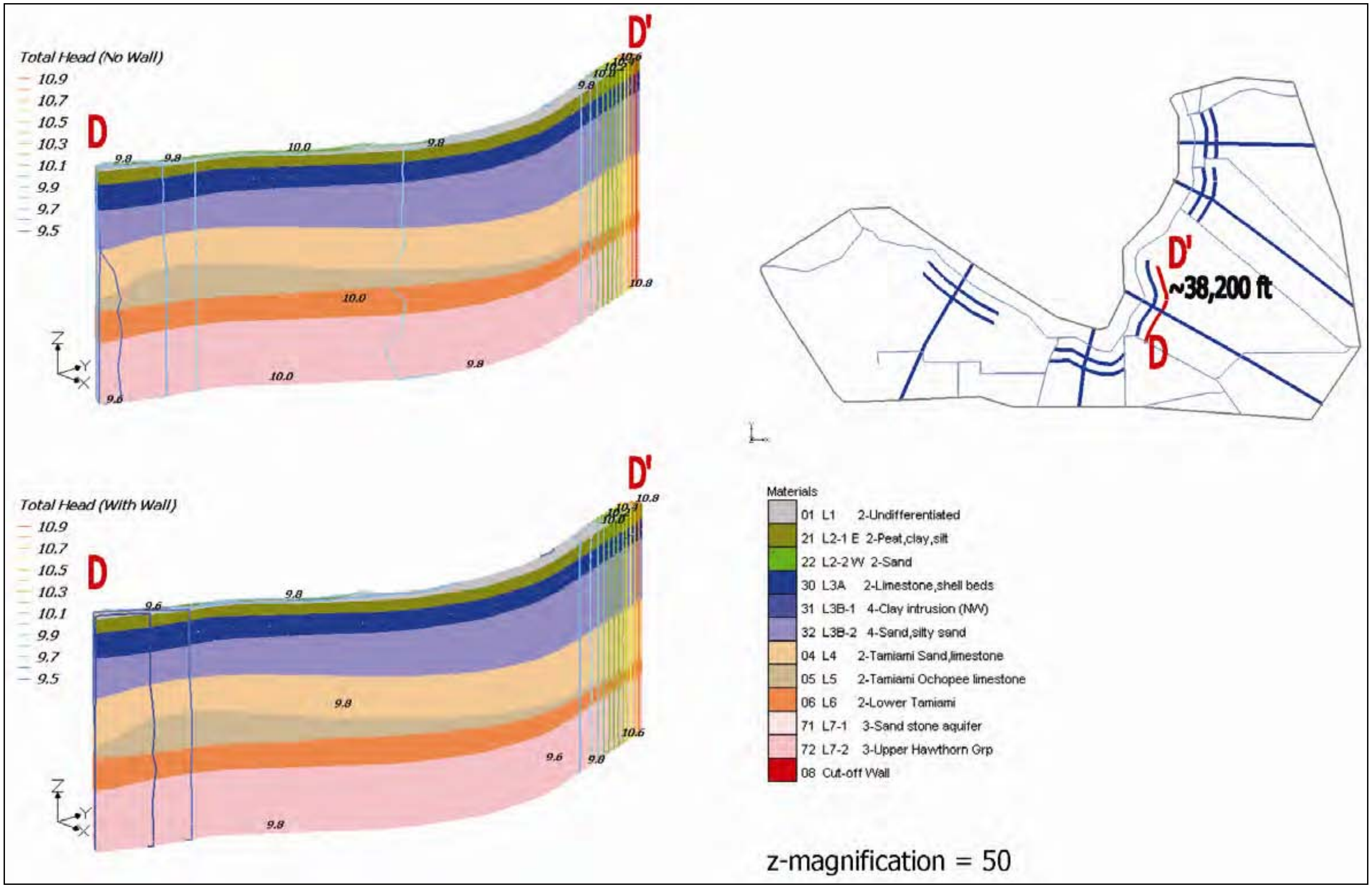


Figure C13. Stage 1 base case total head comparison (linear color contour lines) between "without project" (Run 1, upper left) and "with project" (Run 24, lower left) on Cross Section X1D-10K.

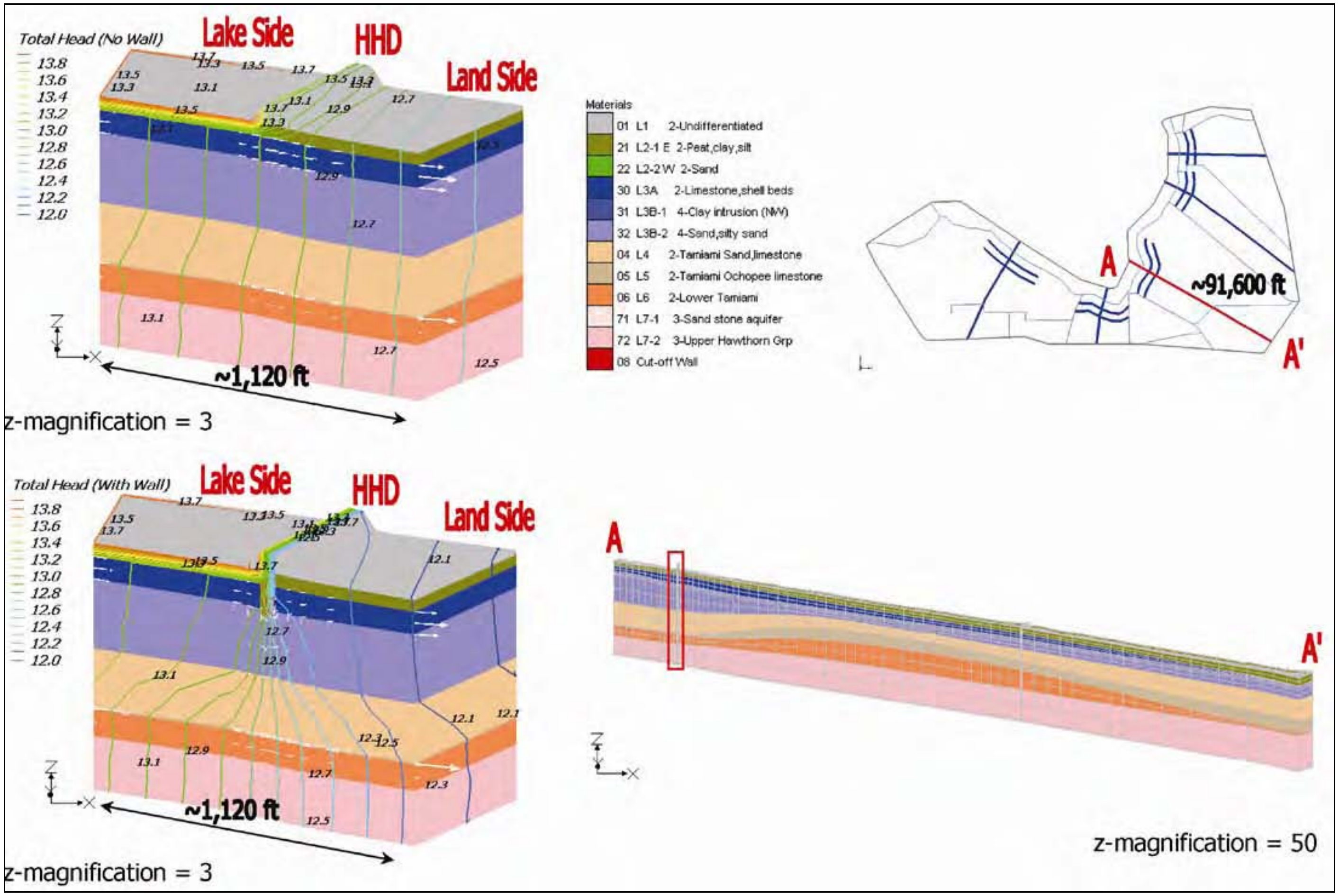


Figure C14. Stage 1 base case zoom-in comparison 1 in the vicinity of HHD between "without project" (Run 1, upper left) and "with project" (Run 24, lower left) on Cross Section X1D-P: total head (linear color contour lines); scaled velocity (light blue arrows).

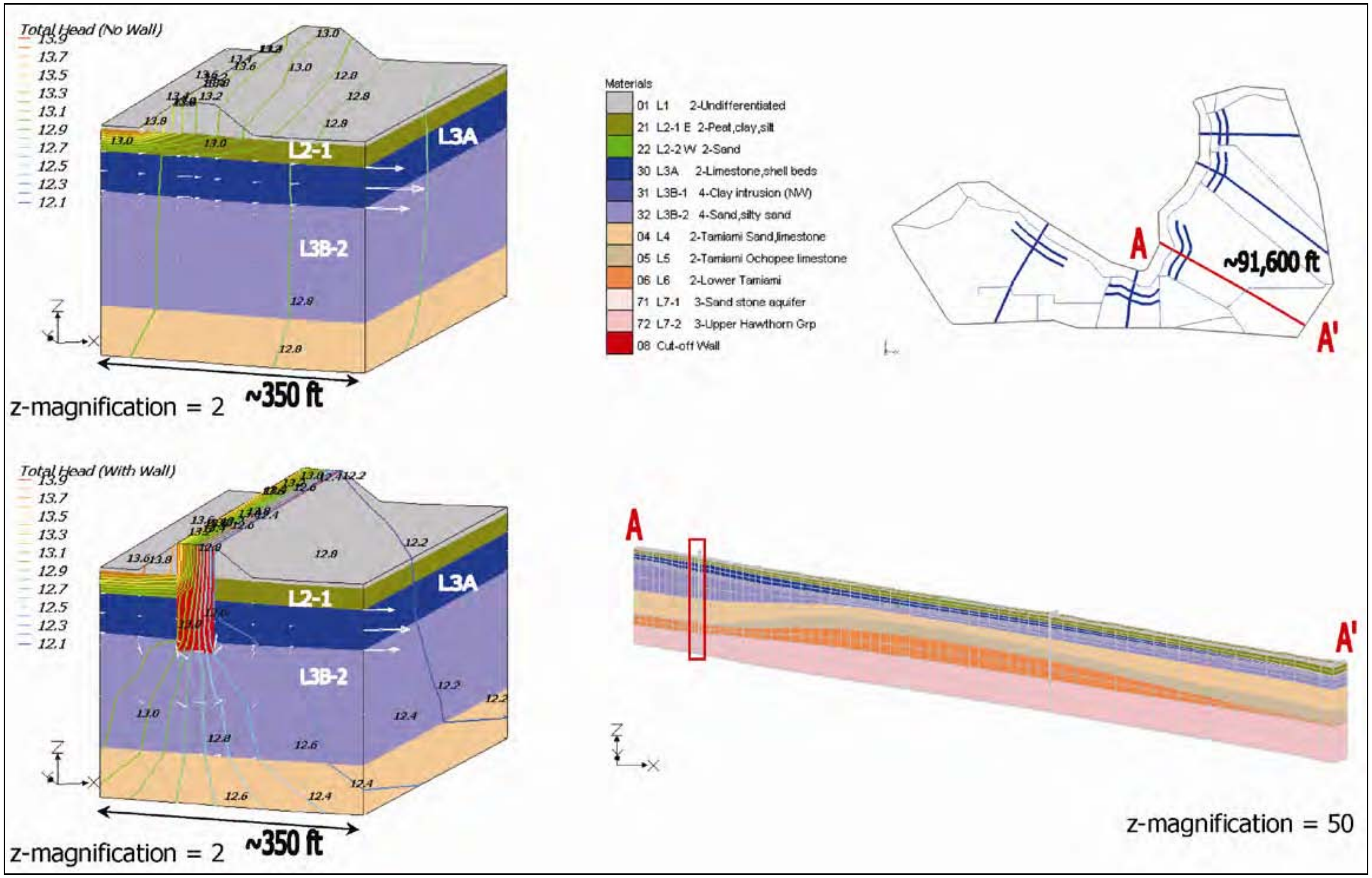


Figure C15. Stage 1 base case zoom-in comparison 2 in the vicinity of HHD between "without project" (Run 1, upper left) and "with project" (Run 24, lower left) on Cross Section X1D-P: total head (linear color contour lines); scaled velocity (light blue arrows).

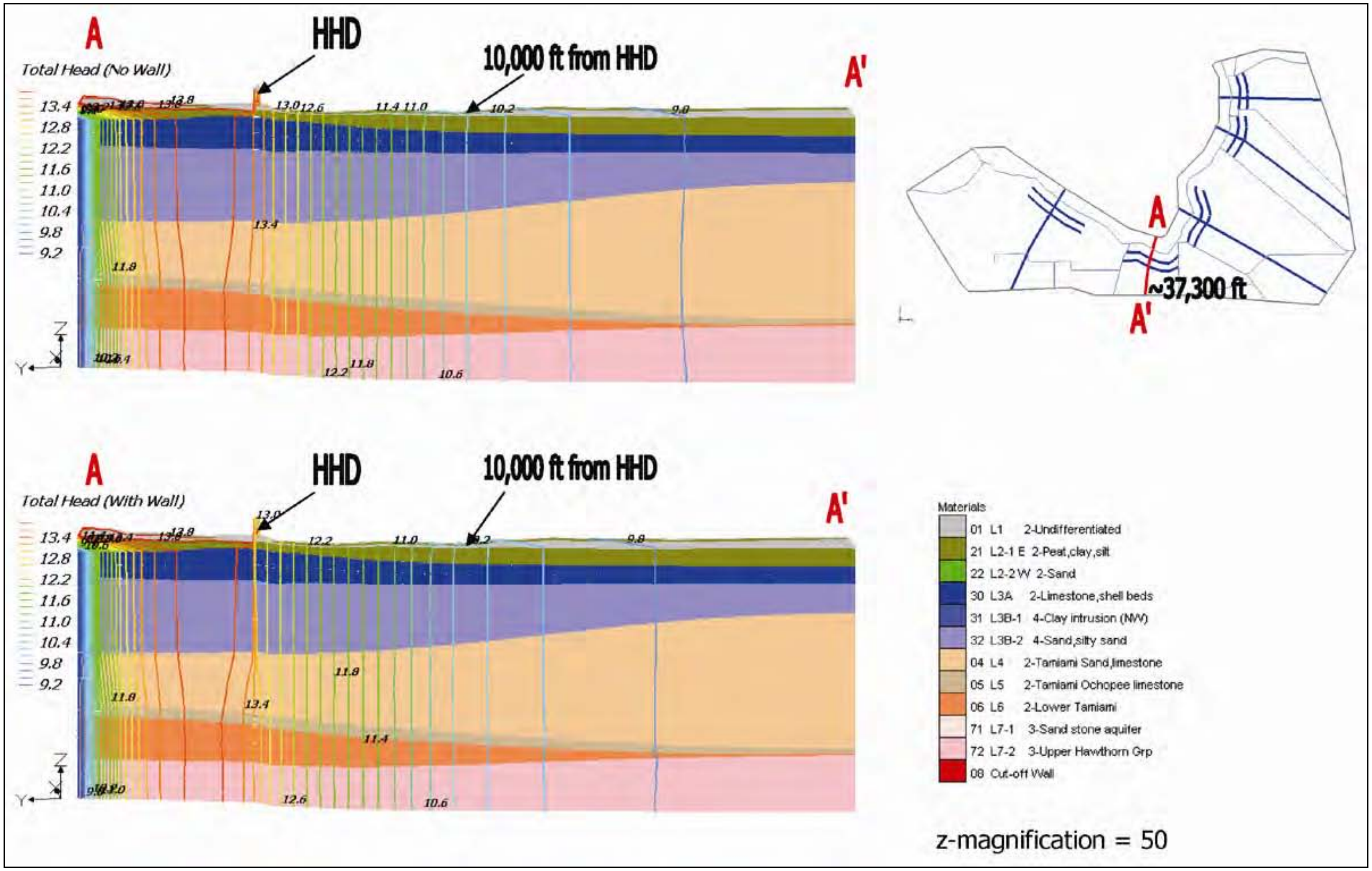


Figure C16. Stage 1 base case total head comparison (linear color contour lines) between "without project" (Run 1, upper left) and "with project" (Run 24, lower left) on Cross Section X3-P.

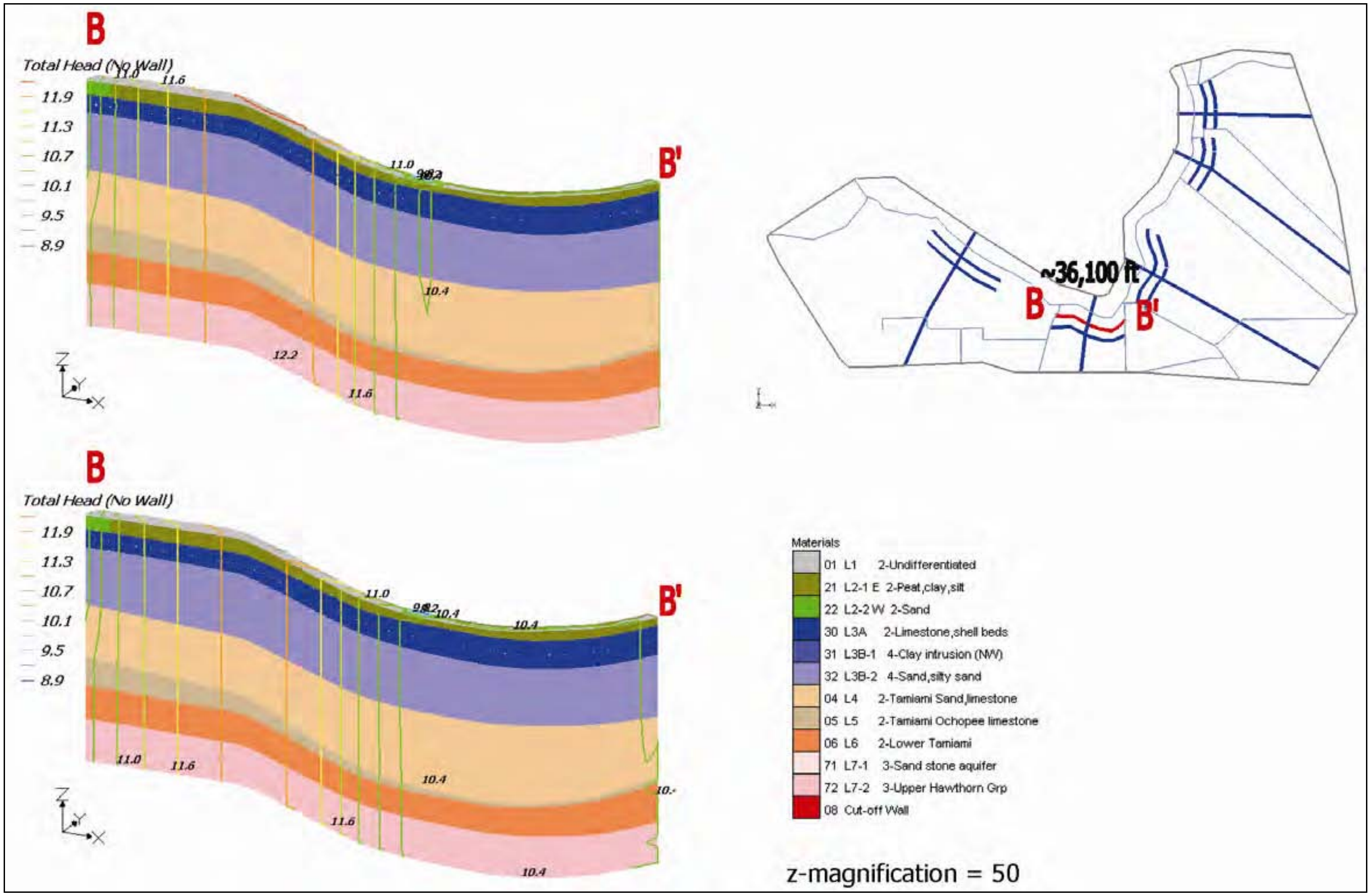


Figure C17. Stage 1 base case total head comparison (linear color contour lines) between "without project" (Run 1, upper left) and "with project" (Run 24, lower left) on Cross Section X3-5K.

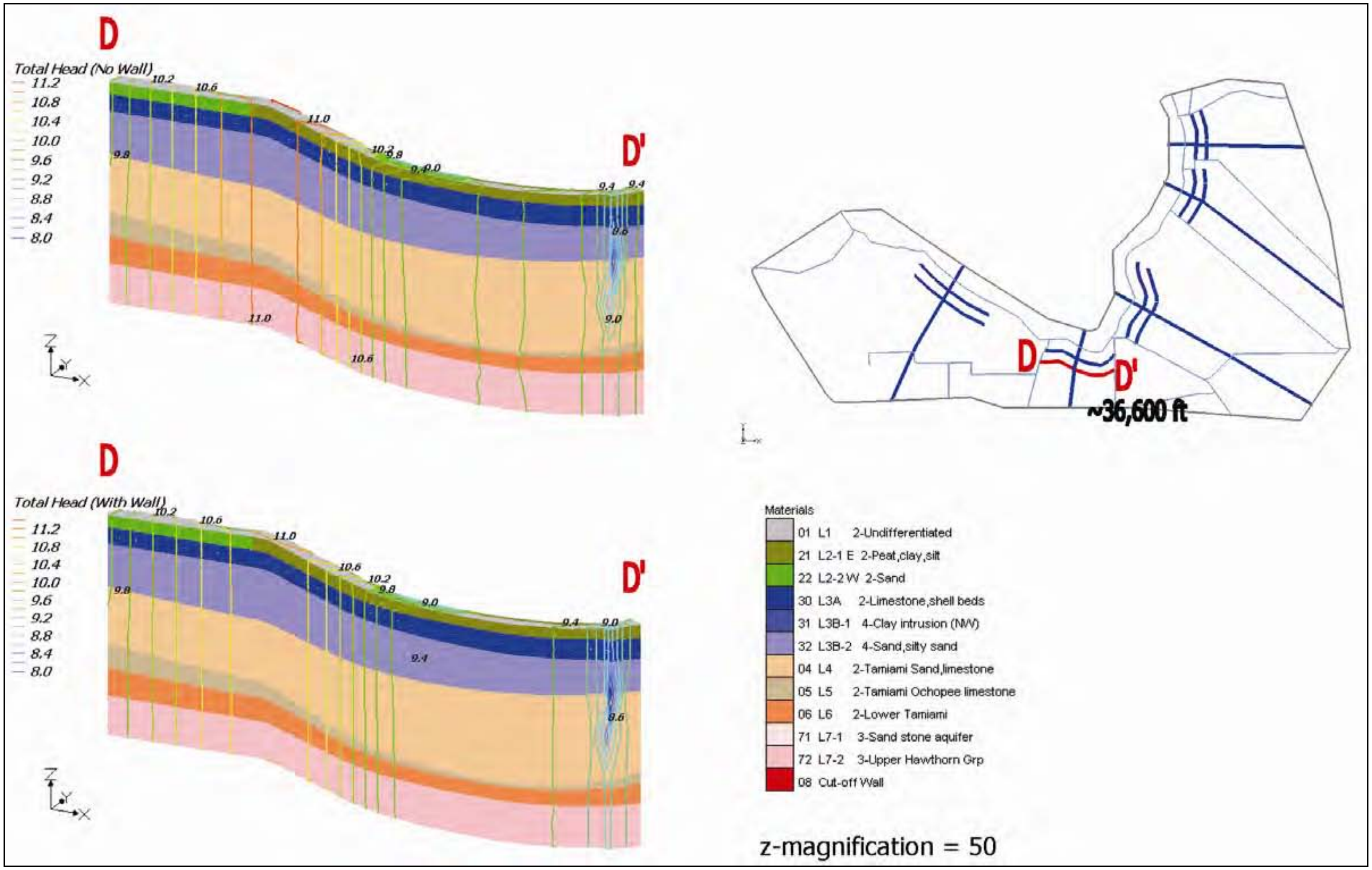


Figure C18. Stage 1 base case total head comparison (linear color contour lines) between "without project" (Run 1, upper left) and "with project" (Run 24, lower left) on Cross Section X3-10K.

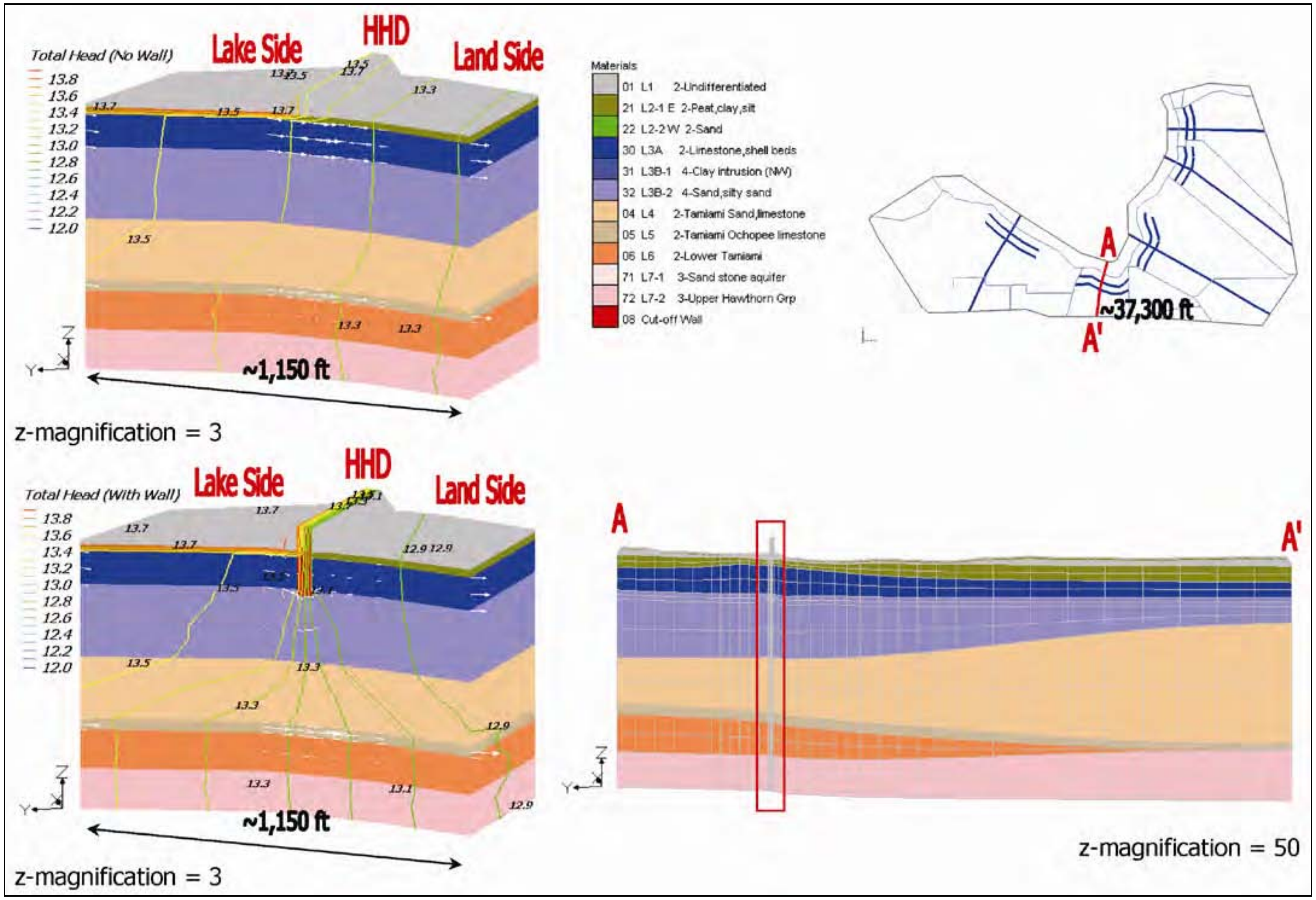


Figure C19. Stage 1 base case zoom-in comparison 1 in the vicinity of HHD between "without project" (Run 1, upper left) and "with project" (Run 24, lower left) on Cross Section X3-P: total head (linear color contour lines); scaled velocity (light blue arrows).

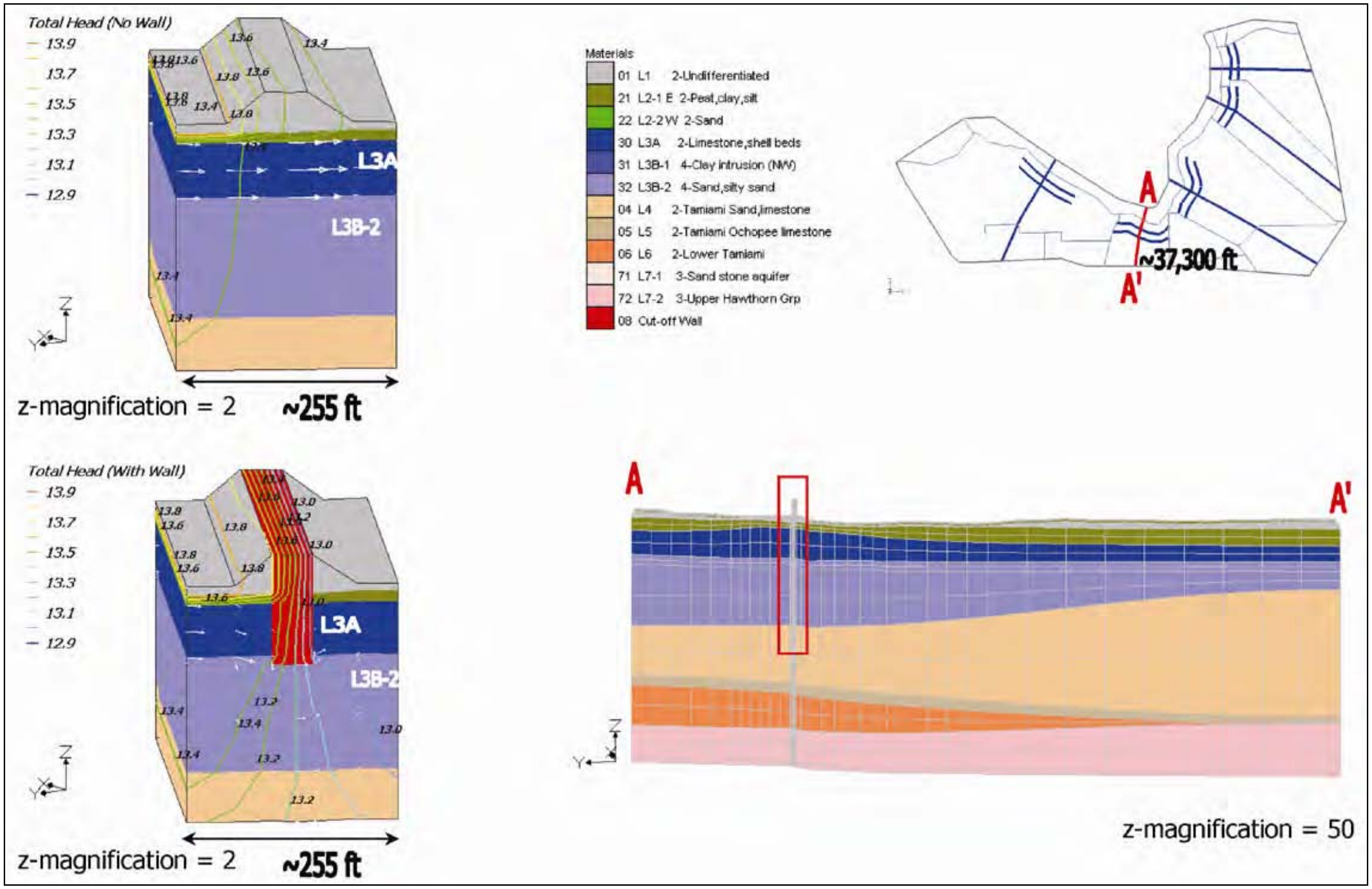


Figure C20. Stage 1 base case zoom-in comparison 2 in the vicinity of HHD between "without project" (Run 1, upper left) and "with project" (Run 24, lower left) on Cross Section X3-P: total head (linear color contour lines); scaled velocity (light blue arrows).

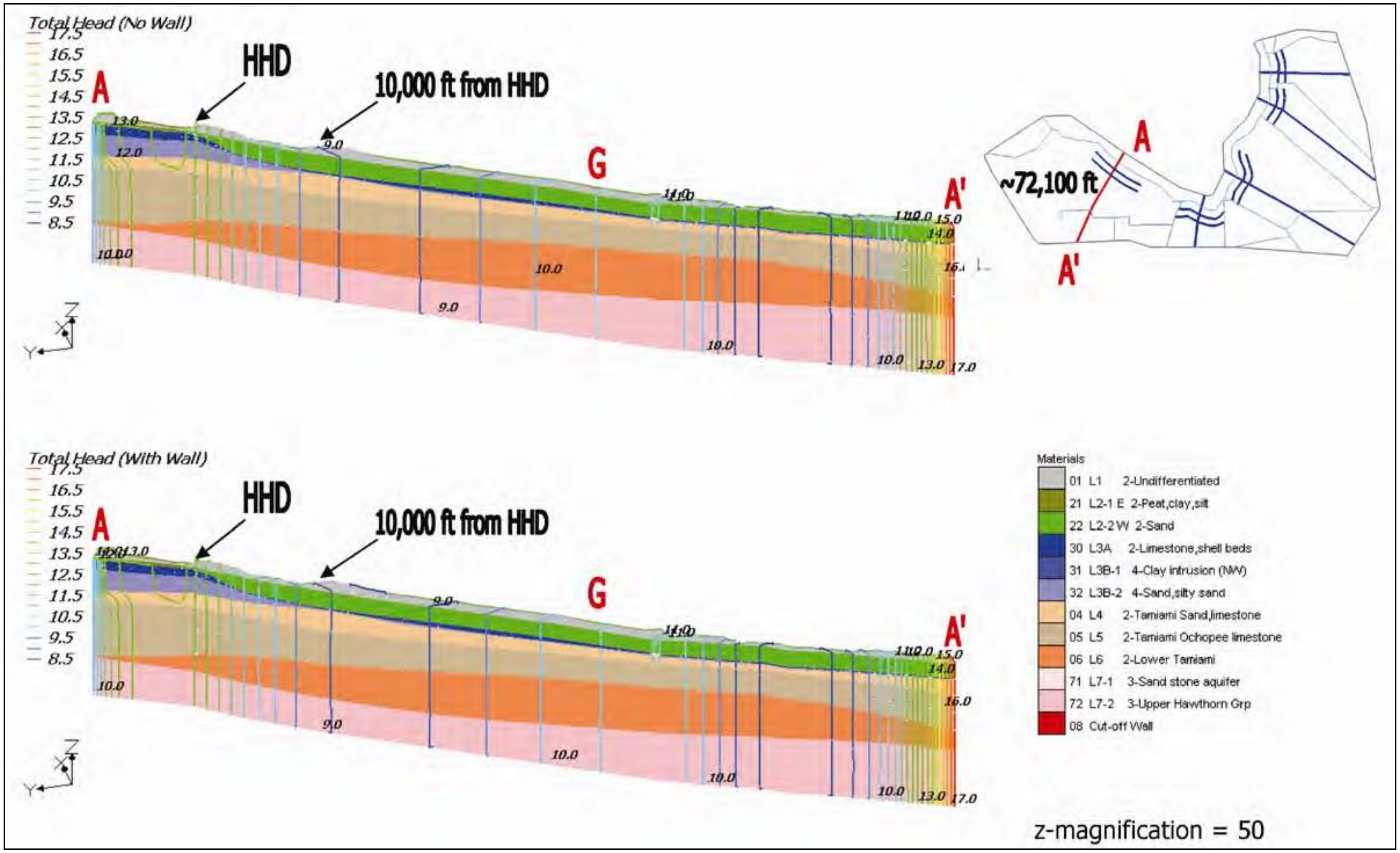


Figure C21. Stage 1 base case total head comparison (linear color contour lines) between "without project" (Run 1, upper left) and "with project" (Run 24, lower left) on Cross Section X2-P.

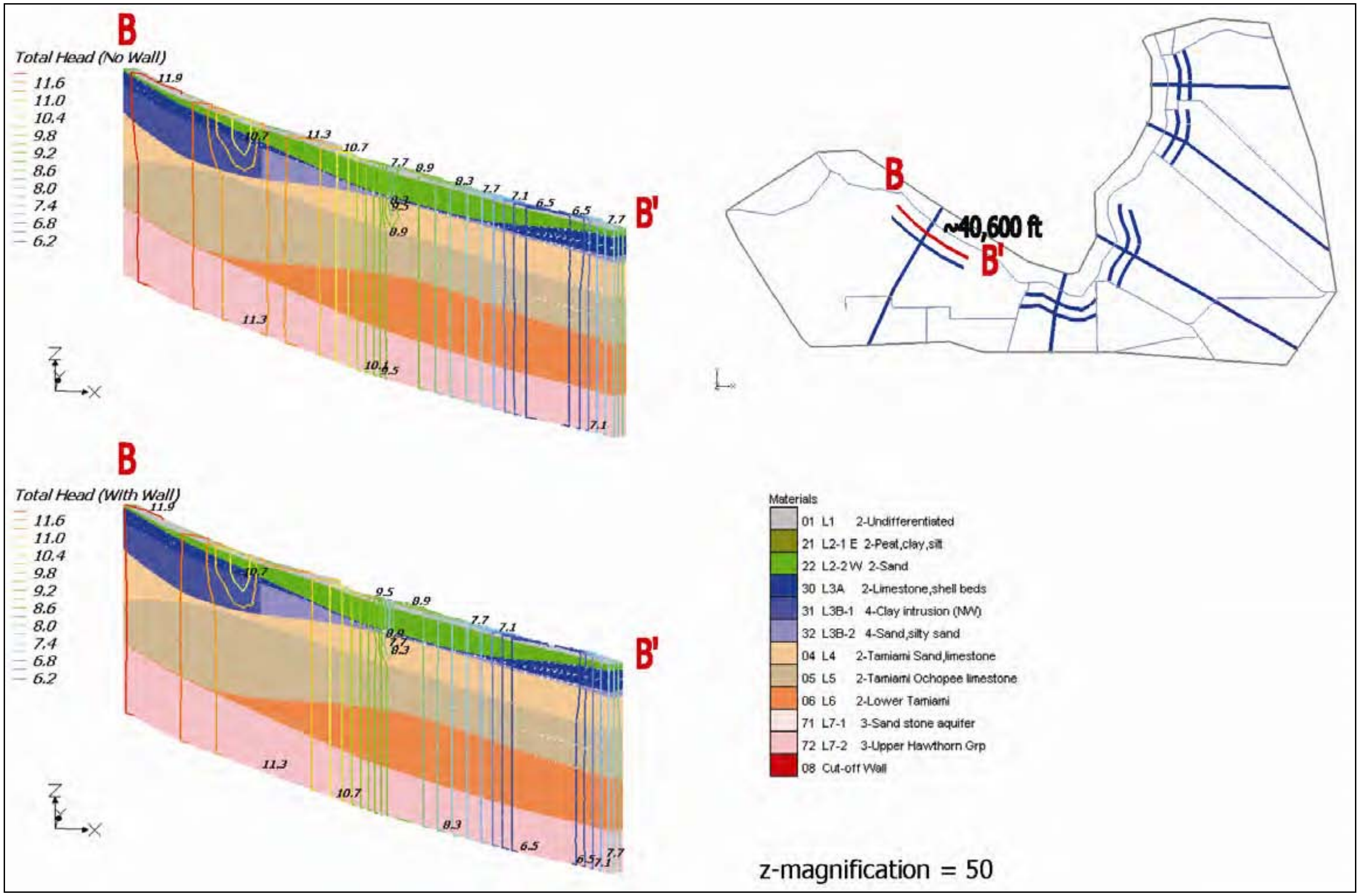


Figure C22. Stage 1 base case total head comparison (linear color contour lines) between "without project" (Run 1, upper left) and "with project" (Run 24, lower left) on Cross Section X2-5K.

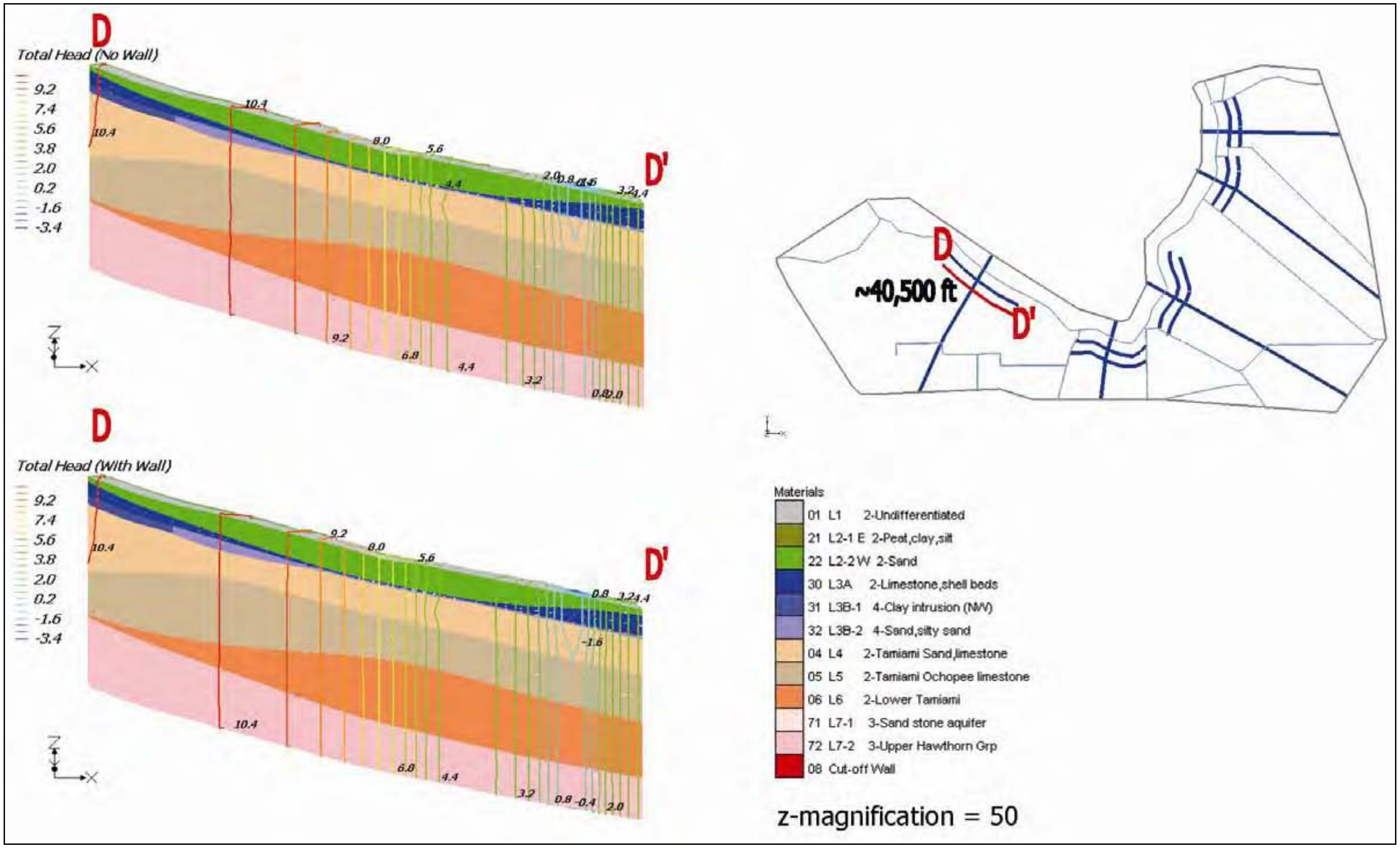


Figure C23. Stage 1 base case total head comparison (linear color contour lines) between "without project" (Run 1, upper left) and "with project" (Run 24, lower left) on Cross Section X2-10K.

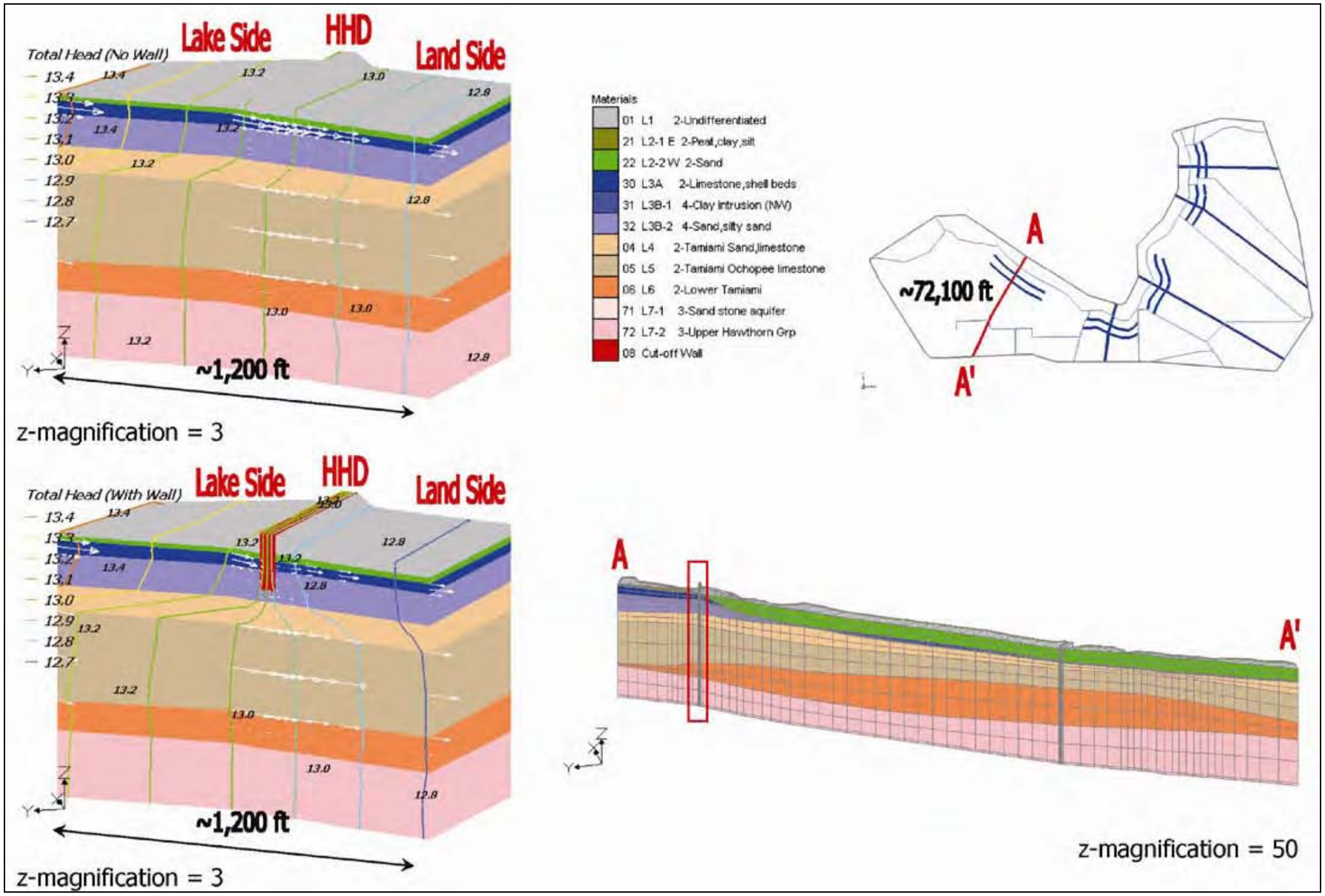


Figure C24. Stage 1 base case zoom-in comparison 1 in the vicinity of HHD between "without project" (Run 1, upper left) and "with project" (Run 24, lower left) on Cross Section X2-P: total head (linear color contour lines); scaled velocity (light blue arrows).

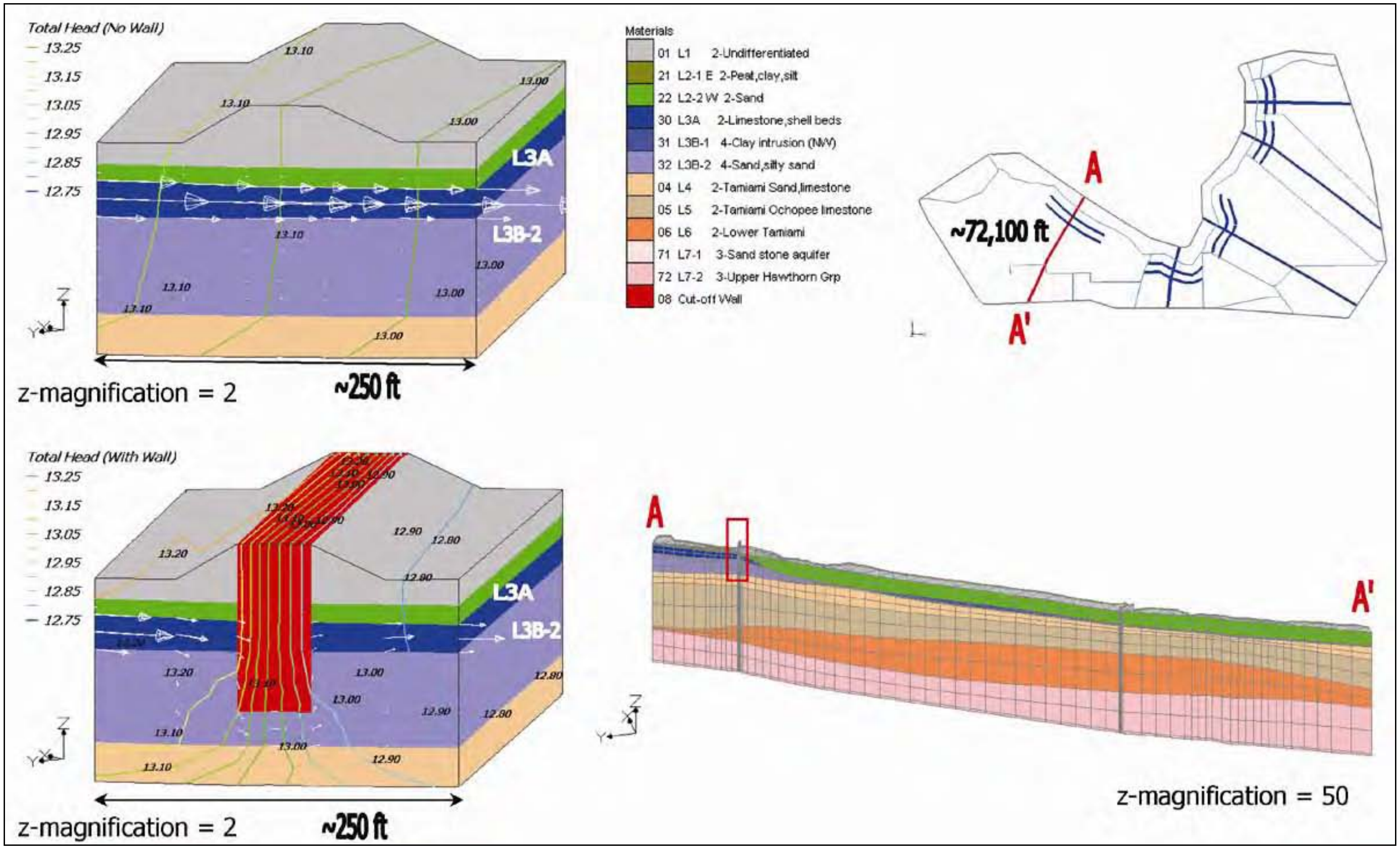


Figure C25. Stage 1 base case zoom-in comparison 2 in the vicinity of HHD between "without project" (Run 1, upper left) and "with project" (Run 24, lower left) on Cross Section X2-P: total head (linear color contour lines); scaled velocity (light blue arrows).

Appendix D. Tables of Stage 2 Results of HHD Phase 1A model.

There are 48 tables (Tables D1 through D48) included in this appendix to show the Stage 2 results of HHD Phase 1A model.

Table D1. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 2 analysis: high net recharge and head boundary conditions, high pumping, high L2-1 K, high L3A K, and high L3B-2 K.

X-section ID	Description	Run 1 vs. Run 49		Difference	Unit Difference*
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cfd/ft
1-1	50 ft from HHD	540765	472411	-68354	-0.1954
1-2	100 ft from HHD	575056	483403	-91653	-0.2620
1-3	200 ft from HHD	652402	502234	-150169	-0.4293
1-4	500 ft from HHD	646811	493874	-152936	-0.4372
1-5	1000 ft from HHD	569970	419086	-150884	-0.4313
1-6	5000 ft from HHD	409996	275896	-134099	-0.3834
1-7	10,000 ft HHD	264083	150702	-113381	-0.3241
Reach 1 average		522726	399658	-123068	-0.3518
2-1	50 ft from HHD	234825	59256	-175568	-1.6205
2-2	100 ft from HHD	288270	98769	-189501	-1.7491
2-3	200 ft from HHD	312647	137684	-174963	-1.6149
2-4	500 ft from HHD	332973	190512	-142461	-1.3149
2-5	1000 ft from HHD	427658	284885	-142773	-1.3178
2-6	5000 ft from HHD	164920	88509	-76411	-0.7053
2-7	10,000 ft HHD	131733	62161	-69572	-0.6422
Reach 2 average		270432	131682	-138750	-1.2807
3-1	50 ft from HHD	81999	19299	-62700	-1.8082
3-2	100 ft from HHD	108828	78388	-30439	-0.8778
3-3	200 ft from HHD	121470	110141	-11329	-0.3267
3-4	500 ft from HHD	191577	183732	-7845	-0.2263
3-5	1000 ft from HHD	234247	226325	-7922	-0.2285
3-6	5000 ft from HHD	157603	151474	-6129	-0.1767
3-7	10,000 ft HHD	154979	148440	-6539	-0.1886
Reach 3 average		150100	131114	-18986	-0.5476
Overall average		**943259**	**662454**	**-280804**	**-0.5698**

cfd = cubic feet per day.

The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/day.

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/day.

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/day.

* Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table D2. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 2 analysis: high net recharge and head boundary conditions, high pumping, high L2-1 K, low L3A K, and high L3B-2 K.

X-section ID	Description	Run 2 vs. Run 50		Difference	Unit Difference*
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cfd/ft
1-1	50 ft from HHD	277266	261268	-15998	-0.0457
1-2	100 ft from HHD	285346	264981	-20365	-0.0582
1-3	200 ft from HHD	292498	265275	-27222	-0.0778
1-4	500 ft from HHD	278427	252008	-26419	-0.0755
1-5	1000 ft from HHD	226925	201341	-25584	-0.0731
1-6	5000 ft from HHD	161554	137961	-23593	-0.0674
1-7	10,000 ft HHD	96747	75808	-20940	-0.0599
Reach 1 average		231252	208378	-22874	-0.0654
2-1	50 ft from HHD	65414	33516	-31897	-0.2944
2-2	100 ft from HHD	77372	42873	-34500	-0.3184
2-3	200 ft from HHD	82503	50941	-31562	-0.2913
2-4	500 ft from HHD	84939	60425	-24515	-0.2263
2-5	1000 ft from HHD	100736	78349	-22387	-0.2066
2-6	5000 ft from HHD	46711	30641	-16070	-0.1483
2-7	10,000 ft HHD	35866	20109	-15757	-0.1454
Reach 2 average		70506	45265	-25241	-0.2330
3-1	50 ft from HHD	22189	7396	-14793	-0.4266
3-2	100 ft from HHD	26126	18991	-7135	-0.2058
3-3	200 ft from HHD	26990	24988	-2002	-0.0577
3-4	500 ft from HHD	37389	36697	-691	-0.0199
3-5	1000 ft from HHD	62807	62178	-629	-0.0181
3-6	5000 ft from HHD	28009	27430	-579	-0.0167
3-7	10,000 ft HHD	68171	67303	-868	-0.0250
Reach 3 average		38812	34998	-3814	-0.1100
Overall average		340570	288640	-51930	-0.1054

cfd = cubic feet per day.

The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/day.

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/day.

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/day.

* Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table D3. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 2 analysis: high net recharge and head boundary conditions, high pumping, low L2-1 K, high L3A K, and high L3B-2 K.

X-section ID	Description	Run 3 vs. Run 51		Difference	Unit Difference*
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cfd/ft
1-1	50 ft from HHD	376010	330112	-45899	-0.1312
1-2	100 ft from HHD	402414	337812	-64602	-0.1847
1-3	200 ft from HHD	472684	363351	-109333	-0.3126
1-4	500 ft from HHD	482336	369584	-112751	-0.3223
1-5	1000 ft from HHD	444154	330355	-113798	-0.3253
1-6	5000 ft from HHD	331858	229633	-102224	-0.2922
1-7	10,000 ft HHD	219640	132527	-87114	-0.2490
Reach 1 average		389871	299054	-90817	-0.2596
2-1	50 ft from HHD	196548	67505	-129043	-1.1911
2-2	100 ft from HHD	226903	92136	-134768	-1.2439
2-3	200 ft from HHD	234984	112552	-122432	-1.1301
2-4	500 ft from HHD	236185	139531	-96654	-0.8921
2-5	1000 ft from HHD	294714	200457	-94257	-0.8700
2-6	5000 ft from HHD	113890	66887	-47003	-0.4339
2-7	10,000 ft HHD	81828	40457	-41370	-0.3819
Reach 2 average		197865	102789	-95075	-0.8776
3-1	50 ft from HHD	46921	10602	-36319	-1.0474
3-2	100 ft from HHD	60230	42651	-17579	-0.5070
3-3	200 ft from HHD	64120	57833	-6287	-0.1813
3-4	500 ft from HHD	111473	107390	-4083	-0.1177
3-5	1000 ft from HHD	184921	179657	-5265	-0.1518
3-6	5000 ft from HHD	140180	135643	-4537	-0.1309
3-7	10,000 ft HHD	174346	169054	-5292	-0.1526
Reach 3 average		111742	100404	-11337	-0.3270
Overall average		699477	502247	-197230	-0.4002

cfd = cubic feet per day.

The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/day.

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/day.

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/day.

* Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table D4. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 2 analysis: high net recharge and head boundary conditions, high pumping, low L2-1 K, low L3A K, and high L3B-2 K.

X-section ID	Description	Run 4 vs. Run 52		Difference	Unit Difference*
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cfd/ft
1-1	50 ft from HHD	225618	212306	-13312	-0.0381
1-2	100 ft from HHD	232423	215805	-16618	-0.0475
1-3	200 ft from HHD	242528	220708	-21820	-0.0624
1-4	500 ft from HHD	236730	215479	-21251	-0.0608
1-5	1000 ft from HHD	203481	182545	-20936	-0.0599
1-6	5000 ft from HHD	154962	135431	-19531	-0.0558
1-7	10,000 ft HHD	94520	77183	-17337	-0.0496
Reach 1 average		198609	179922	-18686	-0.0534
2-1	50 ft from HHD	60332	34958	-25375	-0.2342
2-2	100 ft from HHD	68235	41146	-27089	-0.2500
2-3	200 ft from HHD	70192	45457	-24735	-0.2283
2-4	500 ft from HHD	69755	50775	-18980	-0.1752
2-5	1000 ft from HHD	81137	64045	-17092	-0.1578
2-6	5000 ft from HHD	37214	25015	-12199	-0.1126
2-7	10,000 ft HHD	26430	14507	-11922	-0.1100
Reach 2 average		59042	39415	-19627	-0.1812
3-1	50 ft from HHD	15345	4230	-11115	-0.3205
3-2	100 ft from HHD	17542	11872	-5671	-0.1635
3-3	200 ft from HHD	17492	15733	-1758	-0.0507
3-4	500 ft from HHD	27232	26607	-624	-0.0180
3-5	1000 ft from HHD	66679	65827	-851	-0.0245
3-6	5000 ft from HHD	40183	39344	-838	-0.0242
3-7	10,000 ft HHD	95285	94053	-1233	-0.0356
Reach 3 average		39965	36810	-3156	-0.0910
Overall average		297616	256147	-41470	-0.0841

cfd = cubic feet per day.

The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/day.

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/day.

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/day.

* Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table D5. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 2 analysis: high net recharge and head boundary conditions, high pumping, high L2-1 K, high L3A K, and low L3B-2 K.

X-section ID	Description	Run 5 vs. Run 53		Difference	Unit Difference*
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cfd/ft
1-1	50 ft from HHD	480376	222951	-257425	-0.7359
1-2	100 ft from HHD	514381	229169	-285212	-0.8153
1-3	200 ft from HHD	593869	265476	-328394	-0.9388
1-4	500 ft from HHD	593594	284102	-309492	-0.8848
1-5	1000 ft from HHD	521678	263524	-258154	-0.7380
1-6	5000 ft from HHD	377938	190249	-187690	-0.5366
1-7	10,000 ft HHD	247734	111274	-136460	-0.3901
Reach 1 average		475653	223821	-251832	-0.7199
2-1	50 ft from HHD	229142	77712	-151430	-1.3977
2-2	100 ft from HHD	284836	85917	-198919	-1.8361
2-3	200 ft from HHD	310418	89036	-221383	-2.0434
2-4	500 ft from HHD	331864	110266	-221598	-2.0454
2-5	1000 ft from HHD	422357	175372	-246985	-2.2797
2-6	5000 ft from HHD	163335	33077	-130258	-1.2023
2-7	10,000 ft HHD	129592	5710	-123882	-1.1435
Reach 2 average		267363	82441	-184922	-1.7069
3-1	50 ft from HHD	84051	-6981	-91033	-2.6253
3-2	100 ft from HHD	112689	3044	-109645	-3.1621
3-3	200 ft from HHD	124065	31473	-92592	-2.6703
3-4	500 ft from HHD	186887	98397	-88490	-2.5520
3-5	1000 ft from HHD	212097	129372	-82724	-2.3857
3-6	5000 ft from HHD	128692	74492	-54200	-1.5631
3-7	10,000 ft HHD	117740	64676	-53064	-1.5303
Reach 3 average		138032	56353	-81678	-2.3555
Overall average		**881048**	**362615**	**-518433**	**-1.0520**

cfd = cubic feet per day.

The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/day.

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/day.

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/day.

* Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table D6. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 2 analysis: high net recharge and head boundary conditions, high pumping, high L2-1 K, low L3A K, and low L3B-2 K.

X-section ID	Description	Run 6 vs. Run 54		Difference	Unit Difference*
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cfd/ft
1-1	50 ft from HHD	170523	117687	-52835	-0.1510
1-2	100 ft from HHD	178994	121245	-57749	-0.1651
1-3	200 ft from HHD	192733	131046	-61686	-0.1763
1-4	500 ft from HHD	189721	135465	-54255	-0.1551
1-5	1000 ft from HHD	144276	103332	-40944	-0.1170
1-6	5000 ft from HHD	116313	86219	-30095	-0.0860
1-7	10,000 ft HHD	76612	52270	-24342	-0.0696
Reach 1 average		152739	106752	-45987	-0.1315
2-1	50 ft from HHD	54350	24516	-29833	-0.2754
2-2	100 ft from HHD	66863	26989	-39874	-0.3680
2-3	200 ft from HHD	70953	25969	-44984	-0.4152
2-4	500 ft from HHD	70777	28815	-41961	-0.3873
2-5	1000 ft from HHD	81742	40385	-41357	-0.3817
2-6	5000 ft from HHD	33314	2728	-30585	-0.2823
2-7	10,000 ft HHD	19834	-10427	-30261	-0.2793
Reach 2 average		56833	19854	-36979	-0.3413
3-1	50 ft from HHD	21652	-2213	-23865	-0.6883
3-2	100 ft from HHD	25887	579	-25308	-0.7299
3-3	200 ft from HHD	23421	6832	-16589	-0.4784
3-4	500 ft from HHD	27227	17046	-10181	-0.2936
3-5	1000 ft from HHD	42471	36040	-6431	-0.1855
3-6	5000 ft from HHD	4171	218	-3954	-0.1140
3-7	10,000 ft HHD	33944	28331	-5613	-0.1619
Reach 3 average		25539	12405	-13135	-0.3788
Overall average		**235111**	**139010**	**-96101**	**-0.1950**

cfd = cubic feet per day.

The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/day.

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/day.

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/day.

* Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table D7. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 2 analysis: high net recharge and head boundary conditions, high pumping, low L2-1 K, high L3A K, and low L3B-2 K.

X-section ID	Description	Run 7 vs. Run 55		Difference	Unit Difference*
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cfd/ft
1-1	50 ft from HHD	359824	205020	-154804	-0.4425
1-2	100 ft from HHD	385615	209958	-175657	-0.5022
1-3	200 ft from HHD	454371	244348	-210023	-0.6004
1-4	500 ft from HHD	465919	264966	-200953	-0.5745
1-5	1000 ft from HHD	424765	249111	-175654	-0.5021
1-6	5000 ft from HHD	318169	182270	-135898	-0.3885
1-7	10,000 ft HHD	210697	107822	-102875	-0.2941
Reach 1 average		374194	209071	-165123	-0.4720
2-1	50 ft from HHD	191183	75500	-115684	-1.0678
2-2	100 ft from HHD	224769	83117	-141652	-1.3075
2-3	200 ft from HHD	235584	86558	-149026	-1.3755
2-4	500 ft from HHD	239900	100004	-139896	-1.2913
2-5	1000 ft from HHD	300067	149262	-150805	-1.3920
2-6	5000 ft from HHD	115494	36947	-78547	-0.7250
2-7	10,000 ft HHD	82801	9468	-73333	-0.6769
Reach 2 average		198543	77265	-121277	-1.1194
3-1	50 ft from HHD	51127	-3212	-54339	-1.5671
3-2	100 ft from HHD	66623	4086	-62537	-1.8035
3-3	200 ft from HHD	70577	21870	-48707	-1.4047
3-4	500 ft from HHD	117311	71267	-46043	-1.3278
3-5	1000 ft from HHD	172661	119558	-53103	-1.5314
3-6	5000 ft from HHD	120377	78747	-41630	-1.2006
3-7	10,000 ft HHD	144179	93175	-51003	-1.4709
Reach 3 average		106122	55070	-51052	-1.4723
Overall average		**678859**	**341406**	**-337453**	**-0.6847**

cfd = cubic feet per day.

The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/day.

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/day.

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/day.

* Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table D8. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 2 analysis: high net recharge and head boundary conditions, high pumping, low L2-1 K, low L3A K, and low L3B-2 K.

X-section ID	Description	Run 8 vs. Run 56		Difference	Unit Difference*
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cfd/ft
1-1	50 ft from HHD	156975	118415	-38560	-0.1102
1-2	100 ft from HHD	164151	121960	-42190	-0.1206
1-3	200 ft from HHD	177899	132896	-45004	-0.1287
1-4	500 ft from HHD	178838	138742	-40097	-0.1146
1-5	1000 ft from HHD	140525	108607	-31917	-0.0912
1-6	5000 ft from HHD	117836	92973	-24863	-0.0711
1-7	10,000 ft HHD	76359	55986	-20372	-0.0582
Reach 1 average		144655	109940	-34715	-0.0992
2-1	50 ft from HHD	49467	25036	-24431	-0.2255
2-2	100 ft from HHD	58472	27472	-31000	-0.2861
2-3	200 ft from HHD	60545	27197	-33349	-0.3078
2-4	500 ft from HHD	59234	29377	-29858	-0.2756
2-5	1000 ft from HHD	67881	39006	-28875	-0.2665
2-6	5000 ft from HHD	25898	4621	-21277	-0.1964
2-7	10,000 ft HHD	12503	-8482	-20985	-0.1937
Reach 2 average		47714	20604	-27110	-0.2502
3-1	50 ft from HHD	16085	-788	-16874	-0.4866
3-2	100 ft from HHD	19081	2062	-17018	-0.4908
3-3	200 ft from HHD	17267	6834	-10432	-0.3009
3-4	500 ft from HHD	21949	15605	-6344	-0.1830
3-5	1000 ft from HHD	43758	39018	-4739	-0.1367
3-6	5000 ft from HHD	10625	6987	-3639	-0.1049
3-7	10,000 ft HHD	50742	44129	-6613	-0.1907
Reach 3 average		25644	16264	-9380	-0.2705
Overall average		**218013**	**146808**	**-71205**	**-0.1445**

cfd = cubic feet per day.

The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/day.

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/day.

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/day.

* Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table D9. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 2 analysis: high net recharge and head boundary conditions, low pumping, high L2-1 K, high L3A K, and high L3B-2 K.

X-section ID	Description	Run 9 vs. Run 57		Difference	Unit Difference*
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cfd/ft
1-1	50 ft from HHD	436135	376156	-59979	-0.1715
1-2	100 ft from HHD	468637	385805	-82832	-0.2368
1-3	200 ft from HHD	544464	407876	-136588	-0.3905
1-4	500 ft from HHD	537426	398150	-139276	-0.3982
1-5	1000 ft from HHD	501120	363172	-137948	-0.3944
1-6	5000 ft from HHD	333499	210087	-123411	-0.3528
1-7	10,000 ft HHD	212869	108697	-104172	-0.2978
Reach 1 average		433450	321421	-112029	-0.3203
2-1	50 ft from HHD	237473	73296	-164177	-1.5154
2-2	100 ft from HHD	290540	111996	-178544	-1.6480
2-3	200 ft from HHD	315513	150573	-164940	-1.5224
2-4	500 ft from HHD	338204	203172	-135032	-1.2464
2-5	1000 ft from HHD	432621	296080	-136541	-1.2603
2-6	5000 ft from HHD	178110	103383	-74726	-0.6897
2-7	10,000 ft HHD	152602	83902	-68700	-0.6341
Reach 2 average		277866	146058	-131809	-1.2166
3-1	50 ft from HHD	81442	19166	-62276	-1.7960
3-2	100 ft from HHD	108181	77916	-30264	-0.8728
3-3	200 ft from HHD	121032	109724	-11307	-0.3261
3-4	500 ft from HHD	190843	183017	-7826	-0.2257
3-5	1000 ft from HHD	233879	226069	-7810	-0.2252
3-6	5000 ft from HHD	188130	182185	-5945	-0.1715
3-7	10,000 ft HHD	155818	149752	-6066	-0.1749
Reach 3 average		154189	135404	-18785	-0.5417
Overall average		**865505**	**602883**	**-262623**	**-0.5329**

cfd = cubic feet per day.

The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/day.

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/day.

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/day.

* Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table D10. Cross-sectional flow comparison between "with project" and "with project" runs in Stage 2 analysis: high net recharge and head boundary conditions, low pumping, high L2-1 K, low L3A K, and high L3B-2 K.

X-section ID	Description	Run 10 vs. Run 58		Difference	Unit Difference*
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cfd/ft
1-1	50 ft from HHD	211315	198402	-12914	-0.0369
1-2	100 ft from HHD	218209	201767	-16442	-0.0470
1-3	200 ft from HHD	226351	204720	-21631	-0.0618
1-4	500 ft from HHD	213090	192133	-20957	-0.0599
1-5	1000 ft from HHD	204934	184706	-20228	-0.0578
1-6	5000 ft from HHD	113796	95026	-18770	-0.0537
1-7	10,000 ft HHD	64282	47667	-16616	-0.0475
Reach 1 average		178854	160631	-18223	-0.0521
2-1	50 ft from HHD	84685	57845	-26841	-0.2477
2-2	100 ft from HHD	96726	66824	-29902	-0.2760
2-3	200 ft from HHD	102674	75036	-27638	-0.2551
2-4	500 ft from HHD	106625	84527	-22098	-0.2040
2-5	1000 ft from HHD	122024	101163	-20862	-0.1926
2-6	5000 ft from HHD	71364	55721	-15642	-0.1444
2-7	10,000 ft HHD	64430	48998	-15432	-0.1424
Reach 2 average		92647	70016	-22631	-0.2089
3-1	50 ft from HHD	22051	7370	-14681	-0.4234
3-2	100 ft from HHD	25977	18893	-7084	-0.2043
3-3	200 ft from HHD	26897	24903	-1994	-0.0575
3-4	500 ft from HHD	37135	36444	-691	-0.0199
3-5	1000 ft from HHD	62459	61840	-620	-0.0179
3-6	5000 ft from HHD	60310	59756	-554	-0.0160
3-7	10,000 ft HHD	73197	72408	-789	-0.0227
Reach 3 average		44004	40231	-3773	-0.1088
Overall average		**315504**	**270878**	**-44626**	**-0.0906**

cfd = cubic feet per day.

The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/day.

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/day.

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/day.

* Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table D11. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 2 analysis: high net recharge and head boundary conditions, low pumping, low L2-1 K, high L3A K, and high L3B-2 K.

X-section ID	Description	Run 11 vs. Run 59		Difference	Unit Difference*
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cfd/ft
1-1	50 ft from HHD	226638	191640	-34999	-0.1001
1-2	100 ft from HHD	250706	197314	-53392	-0.1526
1-3	200 ft from HHD	320705	228533	-92172	-0.2635
1-4	500 ft from HHD	332187	236802	-95385	-0.2727
1-5	1000 ft from HHD	340884	243918	-96967	-0.2772
1-6	5000 ft from HHD	228275	140269	-88006	-0.2516
1-7	10,000 ft HHD	153308	78551	-74757	-0.2137
Reach 1 average		264672	188147	-76525	-0.2188
2-1	50 ft from HHD	197301	84140	-113161	-1.0445
2-2	100 ft from HHD	226040	107055	-118985	-1.0983
2-3	200 ft from HHD	234416	126631	-107785	-0.9949
2-4	500 ft from HHD	238225	152521	-85704	-0.7911
2-5	1000 ft from HHD	295396	210704	-84692	-0.7817
2-6	5000 ft from HHD	126565	83018	-43547	-0.4019
2-7	10,000 ft HHD	101269	62274	-38995	-0.3599
Reach 2 average		202745	118049	-84696	-0.7818
3-1	50 ft from HHD	44650	10096	-34554	-0.9965
3-2	100 ft from HHD	57563	40750	-16813	-0.4849
3-3	200 ft from HHD	62026	55891	-6135	-0.1769
3-4	500 ft from HHD	108545	104546	-4000	-0.1153
3-5	1000 ft from HHD	183838	178911	-4927	-0.1421
3-6	5000 ft from HHD	169621	165539	-4082	-0.1177
3-7	10,000 ft HHD	165971	161675	-4296	-0.1239
Reach 3 average		113173	102487	-10687	-0.3082
Overall average		**580590**	**408682**	**-171908**	**-0.3488**

cfd = cubic feet per day.

The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/day.

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/day.

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/day.

* Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table D12. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 2 analysis: high net recharge and head boundary conditions, low pumping, low L2-1 K, low L3A K, and high L3B-2 K.

X-section ID	Description	Run 12 vs. Run 60		Difference	Unit Difference*
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cfd/ft
1-1	50 ft from HHD	126414	117219	-9195	-0.0263
1-2	100 ft from HHD	132089	120094	-11995	-0.0343
1-3	200 ft from HHD	145358	129596	-15762	-0.0451
1-4	500 ft from HHD	142833	127412	-15421	-0.0441
1-5	1000 ft from HHD	158095	142807	-15289	-0.0437
1-6	5000 ft from HHD	89795	75331	-14464	-0.0413
1-7	10,000 ft HHD	53208	40358	-12850	-0.0367
Reach 1 average		121113	107545	-13568	-0.0388
2-1	50 ft from HHD	79595	59580	-20015	-0.1847
2-2	100 ft from HHD	87257	65240	-22018	-0.2032
2-3	200 ft from HHD	89953	69672	-20281	-0.1872
2-4	500 ft from HHD	91023	74881	-16142	-0.1490
2-5	1000 ft from HHD	101661	86550	-15111	-0.1395
2-6	5000 ft from HHD	61859	50490	-11369	-0.1049
2-7	10,000 ft HHD	54745	43532	-11213	-0.1035
Reach 2 average		80870	64278	-16593	-0.1532
3-1	50 ft from HHD	14714	4117	-10597	-0.3056
3-2	100 ft from HHD	16873	11445	-5428	-0.1565
3-3	200 ft from HHD	17016	15304	-1712	-0.0494
3-4	500 ft from HHD	26452	25838	-614	-0.0177
3-5	1000 ft from HHD	66470	65668	-802	-0.0231
3-6	5000 ft from HHD	71585	70834	-751	-0.0217
3-7	10,000 ft HHD	92215	91240	-975	-0.0281
Reach 3 average		43618	40635	-2983	-0.0860
Overall average		**245601**	**212458**	**-33143**	**-0.0673**

cfd = cubic feet per day.

The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/day.

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/day.

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/day.

* Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table D13. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 2 analysis: high net recharge and head boundary conditions, low pumping, high L2-1 K, high L3A K, and low L3B-2 K.

X-section ID	Description	Run 13 vs. Run 61		Difference	Unit Difference*
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cfd/ft
1-1	50 ft from HHD	382914	167763	-215152	-0.6151
1-2	100 ft from HHD	414638	173495	-241143	-0.6894
1-3	200 ft from HHD	489768	208541	-281228	-0.8040
1-4	500 ft from HHD	483351	217071	-266280	-0.7612
1-5	1000 ft from HHD	456399	232182	-224217	-0.6410
1-6	5000 ft from HHD	303229	137729	-165500	-0.4731
1-7	10,000 ft HHD	197004	75571	-121433	-0.3471
Reach 1 average		389615	173193	-216422	-0.6187
2-1	50 ft from HHD	229183	91507	-137676	-1.2708
2-2	100 ft from HHD	284464	98942	-185523	-1.7124
2-3	200 ft from HHD	310728	101702	-209026	-1.9294
2-4	500 ft from HHD	335107	122772	-212335	-1.9599
2-5	1000 ft from HHD	425340	186411	-238929	-2.2054
2-6	5000 ft from HHD	177373	49284	-128089	-1.1823
2-7	10,000 ft HHD	155572	33194	-122378	-1.1296
Reach 2 average		273967	97687	-176279	-1.6271
3-1	50 ft from HHD	83444	-6975	-90419	-2.6076
3-2	100 ft from HHD	111984	2979	-109005	-3.1436
3-3	200 ft from HHD	123602	31357	-92245	-2.6603
3-4	500 ft from HHD	186112	98177	-87935	-2.5360
3-5	1000 ft from HHD	211776	130384	-81393	-2.3473
3-6	5000 ft from HHD	159580	107120	-52460	-1.5129
3-7	10,000 ft HHD	120524	71591	-48933	-1.4112
Reach 3 average		142432	62090	-80341	-2.3170
Overall average		**806013**	**332971**	**-473042**	**-0.9599**

cfd = cubic feet per day.

The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/day.

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/day.

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/day.

* Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table D14. Cross-sectional flow comparison between "with project" and "with project" runs in Stage 2 analysis: high net recharge and head boundary conditions, low pumping, high L2-1 K, low L3A K, and low L3B-2 K.

X-section ID	Description	Run 14 vs. Run 62		Difference	Unit Difference*
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cfd/ft
1-1	50 ft from HHD	124051	84318	-39732	-0.1136
1-2	100 ft from HHD	130651	87498	-43154	-0.1234
1-3	200 ft from HHD	142127	96566	-45561	-0.1302
1-4	500 ft from HHD	135677	95779	-39898	-0.1141
1-5	1000 ft from HHD	148115	118358	-29756	-0.0851
1-6	5000 ft from HHD	77624	55826	-21798	-0.0623
1-7	10,000 ft HHD	48599	31161	-17438	-0.0499
Reach 1 average		115263	81358	-33905	-0.0969
2-1	50 ft from HHD	83562	61172	-22390	-0.2067
2-2	100 ft from HHD	96165	63054	-33111	-0.3056
2-3	200 ft from HHD	101294	62089	-39204	-0.3619
2-4	500 ft from HHD	103361	64977	-38384	-0.3543
2-5	1000 ft from HHD	114033	74994	-39039	-0.3603
2-6	5000 ft from HHD	71627	41819	-29808	-0.2751
2-7	10,000 ft HHD	65330	35704	-29626	-0.2735
Reach 2 average		90767	57687	-33080	-0.3053
3-1	50 ft from HHD	21430	-2217	-23647	-0.6820
3-2	100 ft from HHD	25644	536	-25108	-0.7241
3-3	200 ft from HHD	23284	6771	-16512	-0.4762
3-4	500 ft from HHD	26926	16794	-10131	-0.2922
3-5	1000 ft from HHD	42287	35954	-6333	-0.1826
3-6	5000 ft from HHD	37671	33948	-3723	-0.1074
3-7	10,000 ft HHD	43938	38958	-4980	-0.1436
Reach 3 average		31597	18678	-12919	-0.3726
Overall average		**237628**	**157723**	**-79905**	**-0.1621**

cfd = cubic feet per day.

The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/day.

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/day.

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/day.

* Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table D15. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 2 analysis: high net recharge and head boundary conditions, low pumping, low L2-1 K, high L3A K, and low L3B-2 K.

X-section ID	Description	Run 15 vs. Run 63		Difference	Unit Difference*
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cfd/ft
1-1	50 ft from HHD	216513	116316	-100198	-0.2864
1-2	100 ft from HHD	239551	120412	-119138	-0.3406
1-3	200 ft from HHD	305720	155241	-150479	-0.4302
1-4	500 ft from HHD	314489	168213	-146276	-0.4182
1-5	1000 ft from HHD	325032	192891	-132142	-0.3778
1-6	5000 ft from HHD	216973	110364	-106609	-0.3048
1-7	10,000 ft HHD	145473	62640	-82832	-0.2368
Reach 1 average		251964	132297	-119668	-0.3421
2-1	50 ft from HHD	189458	91328	-98130	-0.9058
2-2	100 ft from HHD	221159	97885	-123274	-1.1378
2-3	200 ft from HHD	232292	100914	-131378	-1.2126
2-4	500 ft from HHD	239701	113617	-126083	-1.1638
2-5	1000 ft from HHD	298356	160637	-137719	-1.2712
2-6	5000 ft from HHD	128702	55086	-73616	-0.6795
2-7	10,000 ft HHD	107047	37735	-69312	-0.6398
Reach 2 average		202388	93886	-108502	-1.0015
3-1	50 ft from HHD	48530	-3145	-51675	-1.4903
3-2	100 ft from HHD	63567	3790	-59777	-1.7239
3-3	200 ft from HHD	68238	21066	-47172	-1.3604
3-4	500 ft from HHD	114112	69913	-44199	-1.2747
3-5	1000 ft from HHD	171097	122477	-48620	-1.4022
3-6	5000 ft from HHD	150037	113780	-36257	-1.0456
3-7	10,000 ft HHD	138208	98561	-39647	-1.1434
Reach 3 average		107684	60920	-46764	-1.3486
Overall average		562036	287103	-274933	-0.5579

cfd = cubic feet per day.

The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/d.

* Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table D16. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 2 analysis: high net recharge and head boundary conditions, low pumping, low L2-1 K, low L3A K, and low L3B-2 K.

X-section ID	Description	Run 16 vs. Run 64		Difference	Unit Difference*
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cfd/ft
1-1	50 ft from HHD	84621	62528	-22093	-0.0632
1-2	100 ft from HHD	90000	65394	-24606	-0.0703
1-3	200 ft from HHD	103588	77163	-26425	-0.0755
1-4	500 ft from HHD	103336	79604	-23732	-0.0678
1-5	1000 ft from HHD	127692	108275	-19417	-0.0555
1-6	5000 ft from HHD	66596	50866	-15730	-0.0450
1-7	10,000 ft HHD	41774	28737	-13038	-0.0373
Reach 1 average		88230	67510	-20720	-0.0592
2-1	50 ft from HHD	79028	62213	-16815	-0.1552
2-2	100 ft from HHD	87731	64027	-23704	-0.2188
2-3	200 ft from HHD	90754	63875	-26879	-0.2481
2-4	500 ft from HHD	91656	66029	-25627	-0.2365
2-5	1000 ft from HHD	99633	73852	-25781	-0.2380
2-6	5000 ft from HHD	64424	44520	-19904	-0.1837
2-7	10,000 ft HHD	57888	38122	-19766	-0.1824
Reach 2 average		81588	58948	-22639	-0.2090
3-1	50 ft from HHD	15312	-789	-16101	-0.4643
3-2	100 ft from HHD	18236	1923	-16313	-0.4705
3-3	200 ft from HHD	16718	6584	-10134	-0.2923
3-4	500 ft from HHD	21156	15011	-6144	-0.1772
3-5	1000 ft from HHD	43263	38857	-4406	-0.1271
3-6	5000 ft from HHD	43589	40528	-3062	-0.0883
3-7	10,000 ft HHD	55054	50325	-4730	-0.1364
Reach 3 average		30475	21777	-8699	-0.2509
Overall average		**200293**	**148235**	**-52058**	**-0.1056**

cfd = cubic feet per day.

The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/d.

* Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table D17. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 2 analysis: medium net recharge and head boundary conditions, high pumping, high L2-1 K, high L3A K, and high L3B-2 K.

X-section ID	Description	Run 17 vs. Run 65		Difference	Unit Difference*
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cfd/ft
1-1	50 ft from HHD	402946	360428	-42518	-0.1215
1-2	100 ft from HHD	420101	367713	-52388	-0.1498
1-3	200 ft from HHD	457519	375975	-81544	-0.2331
1-4	500 ft from HHD	458731	375097	-83634	-0.2391
1-5	1000 ft from HHD	394882	312926	-81956	-0.2343
1-6	5000 ft from HHD	279516	209000	-70516	-0.2016
1-7	10,000 ft HHD	175407	114047	-61359	-0.1754
Reach 1 average		369872	302169	-67702	-0.1935
2-1	50 ft from HHD	136220	36129	-100091	-0.9239
2-2	100 ft from HHD	175600	64873	-110727	-1.0220
2-3	200 ft from HHD	201349	94395	-106954	-0.9872
2-4	500 ft from HHD	224128	134434	-89694	-0.8279
2-5	1000 ft from HHD	290943	205586	-85357	-0.7879
2-6	5000 ft from HHD	118801	63839	-54962	-0.5073
2-7	10,000 ft HHD	89169	39146	-50024	-0.4617
Reach 2 average		176601	91200	-85401	-0.7883
3-1	50 ft from HHD	59189	13480	-45709	-1.3182
3-2	100 ft from HHD	78758	56795	-21964	-0.6334
3-3	200 ft from HHD	88926	80871	-8055	-0.2323
3-4	500 ft from HHD	140245	134764	-5481	-0.1581
3-5	1000 ft from HHD	178820	173208	-5612	-0.1619
3-6	5000 ft from HHD	114165	109745	-4420	-0.1275
3-7	10,000 ft HHD	117950	113132	-4818	-0.1389
Reach 3 average		111150	97428	-13723	-0.3957
Overall average		657623	490797	-166826	-0.3385

cfd = cubic feet per day.

The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/d.

* Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table D18. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 2 analysis: medium net recharge and head boundary conditions, high pumping, high L2-1 K, low L3A K, and high L3B-2 K.

X-section ID	Description	Run 18 vs. Run 66		Difference	Unit Difference*
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cfd/ft
1-1	50 ft from HHD	210835	199812	-11023	-0.0315
1-2	100 ft from HHD	215746	201966	-13780	-0.0394
1-3	200 ft from HHD	216618	198661	-17957	-0.0513
1-4	500 ft from HHD	207410	189956	-17454	-0.0499
1-5	1000 ft from HHD	159119	142163	-16956	-0.0485
1-6	5000 ft from HHD	121986	106277	-15709	-0.0449
1-7	10,000 ft HHD	73090	58830	-14260	-0.0408
Reach 1 average		172115	156809	-15306	-0.0438
2-1	50 ft from HHD	33048	11334	-21714	-0.2004
2-2	100 ft from HHD	41914	18439	-23475	-0.2167
2-3	200 ft from HHD	46577	24696	-21881	-0.2020
2-4	500 ft from HHD	49273	32348	-16925	-0.1562
2-5	1000 ft from HHD	63361	48653	-14707	-0.1358
2-6	5000 ft from HHD	24593	13042	-11550	-0.1066
2-7	10,000 ft HHD	15681	4376	-11306	-0.1044
Reach 2 average		39207	21841	-17365	-0.1603
3-1	50 ft from HHD	15603	4849	-10754	-0.3101
3-2	100 ft from HHD	18426	13353	-5072	-0.1463
3-3	200 ft from HHD	19422	18081	-1341	-0.0387
3-4	500 ft from HHD	27802	27380	-423	-0.0122
3-5	1000 ft from HHD	52169	51757	-412	-0.0119
3-6	5000 ft from HHD	17750	17343	-407	-0.0117
3-7	10,000 ft HHD	52130	51504	-626	-0.0180
Reach 3 average		29043	26324	-2719	-0.0784
Overall average		**240365**	**204974**	**-35390**	**-0.0718**

cfd = cubic feet per day.

The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/d.

* Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table D19. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 2 analysis: medium net recharge and head boundary conditions, high pumping, low L2-1 K, high L3A K, and high L3B-2 K.

X-section ID	Description	Run 19 vs. Run 67		Difference	Unit Difference*
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cfd/ft
1-1	50 ft from HHD	286006	256554	-29453	-0.0842
1-2	100 ft from HHD	300899	260909	-39990	-0.1143
1-3	200 ft from HHD	340153	274352	-65801	-0.1881
1-4	500 ft from HHD	351496	282839	-68657	-0.1963
1-5	1000 ft from HHD	314957	245771	-69186	-0.1978
1-6	5000 ft from HHD	237753	176710	-61044	-0.1745
1-7	10,000 ft HHD	155609	102179	-53430	-0.1527
Reach 1 average		283839	228473	-55366	-0.1583
2-1	50 ft from HHD	119017	38001	-81016	-0.7478
2-2	100 ft from HHD	142730	57185	-85545	-0.7896
2-3	200 ft from HHD	153507	73201	-80306	-0.7412
2-4	500 ft from HHD	158643	94317	-64326	-0.5937
2-5	1000 ft from HHD	201009	141589	-59420	-0.5485
2-6	5000 ft from HHD	81252	46185	-35066	-0.3237
2-7	10,000 ft HHD	53586	22916	-30670	-0.2831
Reach 2 average		129964	67628	-62336	-0.5754
3-1	50 ft from HHD	35229	7692	-27536	-0.7941
3-2	100 ft from HHD	44881	31789	-13092	-0.3776
3-3	200 ft from HHD	47080	42690	-4390	-0.1266
3-4	500 ft from HHD	81508	78768	-2740	-0.0790
3-5	1000 ft from HHD	136739	132994	-3745	-0.1080
3-6	5000 ft from HHD	95720	92360	-3360	-0.0969
3-7	10,000 ft HHD	129862	125850	-4012	-0.1157
Reach 3 average		81574	73163	-8411	-0.2426
Overall average		**495377**	**369265**	**-126112**	**-0.2559**

cfd = cubic feet per day.

The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/d.

* Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table D20. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 2 analysis: medium net recharge and head boundary conditions, high pumping, low L2-1 K, low L3A K, and high L3B-2 K.

X-section ID	Description	Run 20 vs. Run 68		Difference	Unit Difference*
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cfd/ft
1-1	50 ft from HHD	180546	170518	-10028	-0.0287
1-2	100 ft from HHD	185013	172369	-12644	-0.0361
1-3	200 ft from HHD	188128	171760	-16368	-0.0468
1-4	500 ft from HHD	183925	167948	-15977	-0.0457
1-5	1000 ft from HHD	147017	131202	-15815	-0.0452
1-6	5000 ft from HHD	121793	106890	-14903	-0.0426
1-7	10,000 ft HHD	74904	61387	-13516	-0.0386
Reach 1 average		154475	140296	-14179	-0.0405
2-1	50 ft from HHD	30097	10802	-19295	-0.1781
2-2	100 ft from HHD	36301	15979	-20322	-0.1876
2-3	200 ft from HHD	38351	19671	-18681	-0.1724
2-4	500 ft from HHD	38457	24457	-14000	-0.1292
2-5	1000 ft from HHD	49408	37543	-11865	-0.1095
2-6	5000 ft from HHD	17857	8799	-9058	-0.0836
2-7	10,000 ft HHD	9288	454	-8834	-0.0815
Reach 2 average		31394	16815	-14579	-0.1346
3-1	50 ft from HHD	11288	2918	-8370	-0.2414
3-2	100 ft from HHD	12839	8717	-4122	-0.1189
3-3	200 ft from HHD	12797	11667	-1130	-0.0326
3-4	500 ft from HHD	20361	20033	-328	-0.0095
3-5	1000 ft from HHD	51768	51224	-545	-0.0157
3-6	5000 ft from HHD	23614	23028	-586	-0.0169
3-7	10,000 ft HHD	72129	71236	-893	-0.0258
Reach 3 average		29257	26975	-2282	-0.0658
Overall average		**215126**	**184086**	**-31040**	**-0.0630**

cfd = cubic feet per day.

The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/d.

* Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table D21. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 2 analysis: medium net recharge and head boundary conditions, high pumping, high L2-1 K, high L3A K, and low L3B-2 K.

X-section ID	Description	Run 21 vs. Run 69		Difference	Unit Difference*
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cfd/ft
1-1	50 ft from HHD	359247	174177	-185070	-0.5291
1-2	100 ft from HHD	376961	177802	-199159	-0.5693
1-3	200 ft from HHD	418865	201124	-217742	-0.6225
1-4	500 ft from HHD	427855	223658	-204197	-0.5837
1-5	1000 ft from HHD	363885	197155	-166730	-0.4766
1-6	5000 ft from HHD	259572	145080	-114492	-0.3273
1-7	10,000 ft HHD	166278	84813	-81465	-0.2329
Reach 1 average		338952	171973	-166979	-0.4773
2-1	50 ft from HHD	136930	51281	-85649	-0.7906
2-2	100 ft from HHD	177980	57863	-120117	-1.1087
2-3	200 ft from HHD	204645	61082	-143563	-1.3251
2-4	500 ft from HHD	227548	78168	-149380	-1.3788
2-5	1000 ft from HHD	291597	128793	-162804	-1.5027
2-6	5000 ft from HHD	118661	23749	-94912	-0.8761
2-7	10,000 ft HHD	84661	-5434	-90095	-0.8316
Reach 2 average		177432	56500	-120931	-1.1162
3-1	50 ft from HHD	61032	-5417	-66449	-1.9163
3-2	100 ft from HHD	81993	1970	-80023	-2.3078
3-3	200 ft from HHD	91281	23402	-67879	-1.9576
3-4	500 ft from HHD	137199	72941	-64258	-1.8531
3-5	1000 ft from HHD	161533	101279	-60255	-1.7377
3-6	5000 ft from HHD	91813	52089	-39724	-1.1456
3-7	10,000 ft HHD	89044	49370	-39674	-1.1442
Reach 3 average		101985	42233	-59752	-1.7232
Overall average		618369	270706	-347662	-0.7055

cfd = cubic feet per day.

The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/d.

* Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table D22. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 2 analysis: medium net recharge and head boundary conditions, high pumping, high L2-1 K, low L3A K, and low L3B-2 K.

X-section ID	Description	Run 22 vs. Run 70		Difference	Unit Difference*
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cfd/ft
1-1	50 ft from HHD	129876	91897	-37979	-0.1086
1-2	100 ft from HHD	135734	94050	-41684	-0.1192
1-3	200 ft from HHD	144097	100047	-44050	-0.1259
1-4	500 ft from HHD	145314	106336	-38978	-0.1114
1-5	1000 ft from HHD	89328	59305	-30023	-0.0858
1-6	5000 ft from HHD	89612	67143	-22469	-0.0642
1-7	10,000 ft HHD	59572	41080	-18493	-0.0529
Reach 1 average		113362	79980	-33382	-0.0954
2-1	50 ft from HHD	18931	-3063	-21994	-0.2030
2-2	100 ft from HHD	28283	-511	-28794	-0.2658
2-3	200 ft from HHD	32142	-628	-32770	-0.3025
2-4	500 ft from HHD	32427	2337	-30090	-0.2777
2-5	1000 ft from HHD	43335	14615	-28720	-0.2651
2-6	5000 ft from HHD	5592	-16522	-22114	-0.2041
2-7	10,000 ft HHD	-7524	-29372	-21848	-0.2017
Reach 2 average		21884	-4735	-26619	-0.2457
3-1	50 ft from HHD	15648	-1750	-17398	-0.5017
3-2	100 ft from HHD	18743	446	-18297	-0.5277
3-3	200 ft from HHD	17339	5425	-11915	-0.3436
3-4	500 ft from HHD	20950	13745	-7204	-0.2078
3-5	1000 ft from HHD	36133	31541	-4593	-0.1324
3-6	5000 ft from HHD	-1258	-4159	-2901	-0.0837
3-7	10,000 ft HHD	24493	20316	-4177	-0.1205
Reach 3 average		18864	9366	-9498	-0.2739
Overall average		**154110**	**84611**	**-69499**	**-0.1410**

cfd = cubic feet per day.

The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/d.

* Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table D23. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 2 analysis: medium net recharge and head boundary conditions, high pumping, low L2-1 K, high L3A K, and low L3B-2 K.

X-section ID	Description	Run 23 vs. Run 71		Difference	Unit Difference*
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cfd/ft
1-1	50 ft from HHD	278613	165100	-113513	-0.3245
1-2	100 ft from HHD	293841	167617	-126224	-0.3608
1-3	200 ft from HHD	334719	189078	-145641	-0.4163
1-4	500 ft from HHD	350998	211649	-139350	-0.3984
1-5	1000 ft from HHD	307688	187353	-120335	-0.3440
1-6	5000 ft from HHD	232900	142445	-90456	-0.2586
1-7	10,000 ft HHD	152606	84094	-68512	-0.1959
Reach 1 average		278766	163905	-114861	-0.3284
2-1	50 ft from HHD	120229	45948	-74281	-0.6856
2-2	100 ft from HHD	146514	52551	-93963	-0.8673
2-3	200 ft from HHD	159444	56089	-103356	-0.9540
2-4	500 ft from HHD	166357	67331	-99026	-0.9140
2-5	1000 ft from HHD	210493	106485	-104008	-0.9600
2-6	5000 ft from HHD	83701	24071	-59630	-0.5504
2-7	10,000 ft HHD	51549	-3781	-55330	-0.5107
Reach 2 average		134041	49813	-84228	-0.7774
3-1	50 ft from HHD	38877	-2551	-41428	-1.1947
3-2	100 ft from HHD	50340	2903	-47437	-1.3681
3-3	200 ft from HHD	52743	16183	-36560	-1.0544
3-4	500 ft from HHD	86907	52375	-34532	-0.9959
3-5	1000 ft from HHD	128843	88301	-40542	-1.1692
3-6	5000 ft from HHD	81927	49608	-32319	-0.9321
3-7	10,000 ft HHD	107914	67859	-40055	-1.1552
Reach 3 average		78222	39240	-38982	-1.1242
Overall average		**491029**	**252958**	**-238071**	**-0.4831**

cfd = cubic feet per day.

The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/d.

* Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table D24. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 2 analysis: medium net recharge and head boundary conditions, high pumping, low L2-1 K, low L3A K, and low L3B-2 K.

X-section ID	Description	Run 24 vs. Run 72		Difference	Unit Difference*
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cfd/ft
1-1	50 ft from HHD	128486	97573	-30913	-0.0884
1-2	100 ft from HHD	133865	99634	-34231	-0.0979
1-3	200 ft from HHD	141791	105395	-36396	-0.1040
1-4	500 ft from HHD	144648	112072	-32576	-0.0931
1-5	1000 ft from HHD	91655	65287	-26368	-0.0754
1-6	5000 ft from HHD	95291	74303	-20988	-0.0600
1-7	10,000 ft HHD	62549	44947	-17603	-0.0503
Reach 1 average		114041	85601	-28439	-0.0813
2-1	50 ft from HHD	15825	-4588	-20413	-0.1884
2-2	100 ft from HHD	22950	-1917	-24867	-0.2295
2-3	200 ft from HHD	25069	-1489	-26558	-0.2451
2-4	500 ft from HHD	24096	1070	-23026	-0.2125
2-5	1000 ft from HHD	33578	12241	-21336	-0.1969
2-6	5000 ft from HHD	197	-15996	-16193	-0.1495
2-7	10,000 ft HHD	-12511	-28456	-15945	-0.1472
Reach 2 average		15601	-5591	-21191	-0.1956
3-1	50 ft from HHD	12260	-675	-12935	-0.3730
3-2	100 ft from HHD	14534	1587	-12947	-0.3734
3-3	200 ft from HHD	13276	5416	-7861	-0.2267
3-4	500 ft from HHD	17443	12733	-4710	-0.1358
3-5	1000 ft from HHD	35525	31936	-3588	-0.1035
3-6	5000 ft from HHD	1907	-932	-2839	-0.0819
3-7	10,000 ft HHD	37654	32425	-5229	-0.1508
Reach 3 average		18943	11784	-7158	-0.2064
Overall average		148584	91795	-56789	-0.1152

cfd = cubic feet per day.

The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/d.

* Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table D25. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 2 analysis: medium net recharge and head boundary conditions, low pumping, high L2-1 K, high L3A K, and high L3B-2 K.

X-section ID	Description	Run 25 vs. Run 73		Difference	Unit Difference*
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cfd/ft
1-1	50 ft from HHD	299823	266899	-32924	-0.0941
1-2	100 ft from HHD	313655	272710	-40945	-0.1171
1-3	200 ft from HHD	346058	280812	-65245	-0.1865
1-4	500 ft from HHD	341680	274620	-67061	-0.1917
1-5	1000 ft from HHD	305114	239384	-65730	-0.1879
1-6	5000 ft from HHD	197345	140630	-56715	-0.1621
1-7	10,000 ft HHD	119875	70470	-49406	-0.1412
Reach 1 average		274793	220789	-54004	-0.1544
2-1	50 ft from HHD	117056	31837	-85219	-0.7866
2-2	100 ft from HHD	156059	59119	-96940	-0.8948
2-3	200 ft from HHD	183115	88072	-95043	-0.8773
2-4	500 ft from HHD	209644	127836	-81808	-0.7551
2-5	1000 ft from HHD	275178	196145	-79033	-0.7295
2-6	5000 ft from HHD	115857	62951	-52906	-0.4883
2-7	10,000 ft HHD	97626	48731	-48894	-0.4513
Reach 2 average		164934	87813	-77120	-0.7118
3-1	50 ft from HHD	58517	13313	-45204	-1.3037
3-2	100 ft from HHD	77926	56167	-21759	-0.6275
3-3	200 ft from HHD	88194	80161	-8034	-0.2317
3-4	500 ft from HHD	139082	133603	-5480	-0.1580
3-5	1000 ft from HHD	177932	172408	-5524	-0.1593
3-6	5000 ft from HHD	144327	140074	-4253	-0.1226
3-7	10,000 ft HHD	118730	114365	-4365	-0.1259
Reach 3 average		114958	101441	-13517	-0.3898
Overall average		**554685**	**410044**	**-144641**	**-0.2935**

cfd = cubic feet per day.

The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/d.

* Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table D26. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 2 analysis: medium net recharge and head boundary conditions, low pumping, high L2-1 K, low L3A K, and high L3B-2 K.

X-section ID	Description	Run 26 vs. Run 74		Difference	Unit Difference*
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cfd/ft
1-1	50 ft from HHD	146757	139271	-7485	-0.0214
1-2	100 ft from HHD	149812	140756	-9056	-0.0259
1-3	200 ft from HHD	149291	137534	-11757	-0.0336
1-4	500 ft from HHD	138828	127465	-11363	-0.0325
1-5	1000 ft from HHD	121299	110346	-10953	-0.0313
1-6	5000 ft from HHD	70903	60812	-10091	-0.0288
1-7	10,000 ft HHD	37909	28793	-9115	-0.0261
Reach 1 average		116400	106425	-9974	-0.0285
2-1	50 ft from HHD	35689	19762	-15927	-0.1470
2-2	100 ft from HHD	44649	26213	-18436	-0.1702
2-3	200 ft from HHD	50505	32641	-17864	-0.1649
2-4	500 ft from HHD	55311	40543	-14768	-0.1363
2-5	1000 ft from HHD	68565	55161	-13404	-0.1237
2-6	5000 ft from HHD	35978	24795	-11183	-0.1032
2-7	10,000 ft HHD	32584	21563	-11022	-0.1017
Reach 2 average		46183	31525	-14658	-0.1353
3-1	50 ft from HHD	15389	4781	-10608	-0.3059
3-2	100 ft from HHD	18172	13166	-5006	-0.1444
3-3	200 ft from HHD	19180	17850	-1329	-0.0383
3-4	500 ft from HHD	27282	26860	-422	-0.0122
3-5	1000 ft from HHD	51356	50951	-405	-0.0117
3-6	5000 ft from HHD	49652	49268	-384	-0.0111
3-7	10,000 ft HHD	56984	56432	-553	-0.0159
Reach 3 average		34002	31330	-2672	-0.0771
Overall average		**196585**	**169281**	**-27304**	**-0.0554**

cfd = cubic feet per day.

The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/d.

* Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table D27. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 2 analysis: medium net recharge and head boundary conditions, low pumping, low L2-1 K, high L3A K, and high L3B-2 K.

X-section ID	Description	Run 27 vs. Run 75		Difference	Unit Difference*
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cfd/ft
1-1	50 ft from HHD	139494	121955	-17538	-0.0501
1-2	100 ft from HHD	151382	124437	-26945	-0.0770
1-3	200 ft from HHD	189393	142473	-46921	-0.1341
1-4	500 ft from HHD	199283	149644	-49639	-0.1419
1-5	1000 ft from HHD	196668	146200	-50467	-0.1443
1-6	5000 ft from HHD	132815	88073	-44742	-0.1279
1-7	10,000 ft HHD	88660	49431	-39229	-0.1121
Reach 1 average		156813	117459	-39354	-0.1125
2-1	50 ft from HHD	102998	40007	-62991	-0.5814
2-2	100 ft from HHD	125040	56789	-68252	-0.6300
2-3	200 ft from HHD	136551	71603	-64948	-0.5995
2-4	500 ft from HHD	144806	91330	-53477	-0.4936
2-5	1000 ft from HHD	184947	134615	-50332	-0.4646
2-6	5000 ft from HHD	78988	47423	-31565	-0.2914
2-7	10,000 ft HHD	60923	32814	-28109	-0.2594
Reach 2 average		119179	67797	-51382	-0.4743
3-1	50 ft from HHD	32805	7150	-25655	-0.7399
3-2	100 ft from HHD	41987	29706	-12281	-0.3542
3-3	200 ft from HHD	44666	40434	-4233	-0.1221
3-4	500 ft from HHD	78180	75513	-2667	-0.0769
3-5	1000 ft from HHD	135363	131947	-3416	-0.0985
3-6	5000 ft from HHD	125067	122158	-2909	-0.0839
3-7	10,000 ft HHD	121902	118852	-3050	-0.0880
Reach 3 average		82853	75108	-7744	-0.2233
Overall average		**358845**	**260365**	**-98481**	**-0.1998**

cfd = cubic feet per day.

The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/d.

* Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table D28. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 2 analysis: medium net recharge and head boundary conditions, low pumping, low L2-1 K, low L3A K, and high L3B-2 K.

X-section ID	Description	Run 28 vs. Run 76		Difference	Unit Difference*
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cfd/ft
1-1	50 ft from HHD	83782	78281	-5502	-0.0157
1-2	100 ft from HHD	86639	79333	-7306	-0.0209
1-3	200 ft from HHD	91451	81769	-9682	-0.0277
1-4	500 ft from HHD	88582	79072	-9510	-0.0272
1-5	1000 ft from HHD	87709	78239	-9470	-0.0271
1-6	5000 ft from HHD	54829	45859	-8971	-0.0256
1-7	10,000 ft HHD	32109	23971	-8138	-0.0233
Reach 1 average		75014	66646	-8368	-0.0239
2-1	50 ft from HHD	34160	21058	-13102	-0.1209
2-2	100 ft from HHD	40122	25402	-14720	-0.1359
2-3	200 ft from HHD	43247	29182	-14066	-0.1298
2-4	500 ft from HHD	45269	33961	-11308	-0.1044
2-5	1000 ft from HHD	55041	44968	-10073	-0.0930
2-6	5000 ft from HHD	29451	21175	-8276	-0.0764
2-7	10,000 ft HHD	26048	17915	-8133	-0.0751
Reach 2 average		39048	27666	-11383	-0.1051
3-1	50 ft from HHD	10579	2769	-7810	-0.2252
3-2	100 ft from HHD	12064	8204	-3860	-0.1113
3-3	200 ft from HHD	12178	11100	-1078	-0.0311
3-4	500 ft from HHD	19345	19027	-318	-0.0092
3-5	1000 ft from HHD	51278	50782	-495	-0.0143
3-6	5000 ft from HHD	54821	54320	-501	-0.0145
3-7	10,000 ft HHD	69276	68615	-661	-0.0191
Reach 3 average		32791	30688	-2103	-0.0607
Overall average		**146854**	**125000**	**-21854**	**-0.0443**

cfd = cubic feet per day.

The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/d.

* Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table D29. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 2 analysis: medium net recharge and head boundary conditions, low pumping, high L2-1 K, high L3A K, and low L3B-2 K.

X-section ID	Description	Run 29 vs. Run 77		Difference	Unit Difference*
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cfd/ft
1-1	50 ft from HHD	262919	120166	-142753	-0.4081
1-2	100 ft from HHD	276297	123143	-153154	-0.4378
1-3	200 ft from HHD	308840	140766	-168074	-0.4805
1-4	500 ft from HHD	305706	148023	-157684	-0.4508
1-5	1000 ft from HHD	274570	146047	-128524	-0.3674
1-6	5000 ft from HHD	176848	88982	-87866	-0.2512
1-7	10,000 ft HHD	109426	46979	-62447	-0.1785
Reach 1 average		244944	116301	-128643	-0.3678
2-1	50 ft from HHD	112089	45245	-66844	-0.6170
2-2	100 ft from HHD	152740	50256	-102484	-0.9459
2-3	200 ft from HHD	181067	52932	-128135	-1.1827
2-4	500 ft from HHD	208792	69917	-138875	-1.2818
2-5	1000 ft from HHD	271222	117350	-153872	-1.4203
2-6	5000 ft from HHD	115802	23732	-92070	-0.8498
2-7	10,000 ft HHD	99304	10973	-88331	-0.8153
Reach 2 average		163002	52915	-110087	-1.0161
3-1	50 ft from HHD	60299	-5379	-65678	-1.8941
3-2	100 ft from HHD	81077	1904	-79173	-2.2833
3-3	200 ft from HHD	90486	23166	-67321	-1.9415
3-4	500 ft from HHD	135949	72382	-63567	-1.8332
3-5	1000 ft from HHD	160679	101849	-58831	-1.6966
3-6	5000 ft from HHD	122338	84387	-37952	-1.0945
3-7	10,000 ft HHD	91780	56196	-35584	-1.0262
Reach 3 average		106087	47786	-58301	-1.6813
Overall average		**514033**	**217002**	**-297031**	**-0.6027**

cfd = cubic feet per day.

The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/d.

* Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table D30. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 2 analysis: medium net recharge and head boundary conditions, low pumping, high L2-1 K, low L3A K, and low L3B-2 K.

X-section ID	Description	Run 30 vs. Run 78		Difference	Unit Difference*
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cfd/ft
1-1	50 ft from HHD	84779	59474	-25304	-0.0723
1-2	100 ft from HHD	87730	60819	-26911	-0.0769
1-3	200 ft from HHD	90145	62364	-27781	-0.0794
1-4	500 ft from HHD	84673	60497	-24176	-0.0691
1-5	1000 ft from HHD	79336	61488	-17847	-0.0510
1-6	5000 ft from HHD	45617	33010	-12606	-0.0360
1-7	10,000 ft HHD	27297	17266	-10032	-0.0287
Reach 1 average		71368	50703	-20665	-0.0591
2-1	50 ft from HHD	33654	20565	-13089	-0.1208
2-2	100 ft from HHD	43117	22099	-21018	-0.1940
2-3	200 ft from HHD	48638	22112	-26526	-0.2448
2-4	500 ft from HHD	52115	25478	-26637	-0.2459
2-5	1000 ft from HHD	62026	35494	-26533	-0.2449
2-6	5000 ft from HHD	34706	13301	-21404	-0.1976
2-7	10,000 ft HHD	31549	10298	-21250	-0.1961
Reach 2 average		43686	21335	-22351	-0.2063
3-1	50 ft from HHD	15333	-1746	-17079	-0.4925
3-2	100 ft from HHD	18358	375	-17983	-0.5186
3-3	200 ft from HHD	17012	5264	-11747	-0.3388
3-4	500 ft from HHD	20344	13233	-7111	-0.2051
3-5	1000 ft from HHD	35495	31021	-4474	-0.1290
3-6	5000 ft from HHD	31864	29198	-2665	-0.0769
3-7	10,000 ft HHD	34327	30758	-3569	-0.1029
Reach 3 average		24676	15443	-9233	-0.2663
Overall average		139730	87481	-52249	-0.1060

cfd = cubic feet per day.

The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/d.

* Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table D31. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 2 analysis: medium net recharge and head boundary conditions, low pumping, low L2-1 K, high L3A K, and low L3B-2 K.

X-section ID	Description	Run 31 vs. Run 79		Difference	Unit Difference*
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cfd/ft
1-1	50 ft from HHD	137721	78393	-59328	-0.1696
1-2	100 ft from HHD	148996	80170	-68826	-0.1968
1-3	200 ft from HHD	184564	99905	-84659	-0.2420
1-4	500 ft from HHD	192927	110228	-82700	-0.2364
1-5	1000 ft from HHD	189660	115657	-74003	-0.2116
1-6	5000 ft from HHD	127668	69935	-57733	-0.1650
1-7	10,000 ft HHD	84658	39413	-45245	-0.1293
Reach 1 average		152313	84814	-67499	-0.1930
2-1	50 ft from HHD	98534	45810	-52724	-0.4867
2-2	100 ft from HHD	122891	50526	-72365	-0.6679
2-3	200 ft from HHD	136845	53352	-83492	-0.7707
2-4	500 ft from HHD	147870	63657	-84213	-0.7773
2-5	1000 ft from HHD	189351	98952	-90399	-0.8344
2-6	5000 ft from HHD	81367	27123	-54244	-0.5007
2-7	10,000 ft HHD	64952	13914	-51038	-0.4711
Reach 2 average		120258	50476	-69782	-0.6441
3-1	50 ft from HHD	36108	-2438	-38546	-1.1116
3-2	100 ft from HHD	47018	2623	-44395	-1.2803
3-3	200 ft from HHD	50028	15274	-34754	-1.0023
3-4	500 ft from HHD	83227	50736	-32490	-0.9370
3-5	1000 ft from HHD	126919	91034	-35885	-1.0349
3-6	5000 ft from HHD	111445	84587	-26858	-0.7746
3-7	10,000 ft HHD	102341	73501	-28840	-0.8317
Reach 3 average		79584	45045	-34538	-0.9961
Overall average		352155	180336	-171820	-0.3486

cfd = cubic feet per day.

The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/d.

* Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table D32. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 2 analysis: medium net recharge and head boundary conditions, low pumping, low L2-1 K, low L3A K, and low L3B-2 K.

X-section ID	Description	Run 32 vs. Run 80		Difference	Unit Difference*
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cfd/ft
1-1	50 ft from HHD	57885	43334	-14551	-0.0416
1-2	100 ft from HHD	60620	44440	-16180	-0.0463
1-3	200 ft from HHD	65702	48375	-17327	-0.0495
1-4	500 ft from HHD	64250	48710	-15539	-0.0444
1-5	1000 ft from HHD	66869	54107	-12762	-0.0365
1-6	5000 ft from HHD	40208	29960	-10248	-0.0293
1-7	10,000 ft HHD	24936	16328	-8608	-0.0246
Reach 1 average		54353	40751	-13602	-0.0389
2-1	50 ft from HHD	32461	21255	-11206	-0.1034
2-2	100 ft from HHD	39295	22854	-16441	-0.1518
2-3	200 ft from HHD	42944	23423	-19521	-0.1802
2-4	500 ft from HHD	44939	26157	-18782	-0.1734
2-5	1000 ft from HHD	53057	34691	-18366	-0.1695
2-6	5000 ft from HHD	29825	14984	-14840	-0.1370
2-7	10,000 ft HHD	26642	11936	-14706	-0.1357
Reach 2 average		38452	22186	-16266	-0.1501
3-1	50 ft from HHD	11386	-662	-12048	-0.3475
3-2	100 ft from HHD	13538	1427	-12112	-0.3493
3-3	200 ft from HHD	12528	5066	-7462	-0.2152
3-4	500 ft from HHD	16316	11856	-4460	-0.1286
3-5	1000 ft from HHD	34689	31464	-3225	-0.0930
3-6	5000 ft from HHD	34628	32376	-2253	-0.0650
3-7	10,000 ft HHD	42153	38728	-3425	-0.0988
Reach 3 average		23606	17179	-6426	-0.1853
Overall average		**116410**	**80116**	**-36295**	**-0.0736**

cfd = cubic feet per day.

The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/d.

* Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table D33. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 2 analysis: low net recharge and head boundary conditions, high pumping, high L2-1 K, high L3A K, and high L3B-2 K.

X-section ID	Description	Run 33 vs. Run 81		Difference	Unit Difference*
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cfd/ft
1-1	50 ft from HHD	71298	61740	-9558	-0.0273
1-2	100 ft from HHD	77905	62250	-15655	-0.0448
1-3	200 ft from HHD	96196	70296	-25900	-0.0740
1-4	500 ft from HHD	110657	83668	-26988	-0.0772
1-5	1000 ft from HHD	97325	70225	-27099	-0.0775
1-6	5000 ft from HHD	83396	58491	-24905	-0.0712
1-7	10,000 ft HHD	61338	39217	-22120	-0.0632
Reach 1 average		85445	63698	-21746	-0.0622
2-1	50 ft from HHD	48838	19157	-29681	-0.2740
2-2	100 ft from HHD	54035	25032	-29003	-0.2677
2-3	200 ft from HHD	52877	27508	-25369	-0.2342
2-4	500 ft from HHD	48488	30145	-18343	-0.1693
2-5	1000 ft from HHD	53486	37669	-15818	-0.1460
2-6	5000 ft from HHD	25034	17463	-7571	-0.0699
2-7	10,000 ft HHD	7497	1298	-6199	-0.0572
Reach 2 average		41465	22610	-18855	-0.1740
3-1	50 ft from HHD	6821	1320	-5502	-0.1587
3-2	100 ft from HHD	8235	5672	-2564	-0.0739
3-3	200 ft from HHD	6216	5484	-732	-0.0211
3-4	500 ft from HHD	8158	7771	-388	-0.0112
3-5	1000 ft from HHD	5615	5234	-381	-0.0110
3-6	5000 ft from HHD	-28880	-29149	-269	-0.0078
3-7	10,000 ft HHD	-5529	-5807	-279	-0.0080
Reach 3 average		91	-1354	-1445	-0.0417
Overall average		127001	84955	-42046	-0.0853

cfd = cubic feet per day.

The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/d.

* Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table D34. Cross-sectional flow comparison between "with project" and "with project" runs in Stage 2 analysis: low net recharge and head boundary conditions, high pumping, high L2-1 K, low L3A K, and high L3B-2 K.

X-section ID	Description	Run 34 vs. Run 82		Difference	Unit Difference*
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cfd/ft
1-1	50 ft from HHD	42535	39611	-2925	-0.0084
1-2	100 ft from HHD	44272	39910	-4362	-0.0125
1-3	200 ft from HHD	47523	41738	-5784	-0.0165
1-4	500 ft from HHD	52304	46547	-5757	-0.0165
1-5	1000 ft from HHD	35110	29392	-5717	-0.0163
1-6	5000 ft from HHD	42172	36615	-5557	-0.0159
1-7	10,000 ft HHD	30682	25512	-5170	-0.0148
Reach 1 average		42085	37046	-5039	-0.0144
2-1	50 ft from HHD	7839	1527	-6313	-0.0583
2-2	100 ft from HHD	8830	3013	-5818	-0.0537
2-3	200 ft from HHD	8164	3444	-4720	-0.0436
2-4	500 ft from HHD	6878	3922	-2956	-0.0273
2-5	1000 ft from HHD	7937	5796	-2140	-0.0198
2-6	5000 ft from HHD	1194	-186	-1380	-0.0127
2-7	10,000 ft HHD	-5780	-7109	-1328	-0.0123
Reach 2 average		5009	1487	-3522	-0.0325
3-1	50 ft from HHD	1457	203	-1254	-0.0362
3-2	100 ft from HHD	1768	1173	-595	-0.0172
3-3	200 ft from HHD	1417	1278	-138	-0.0040
3-4	500 ft from HHD	1962	1937	-25	-0.0007
3-5	1000 ft from HHD	1298	1277	-21	-0.0006
3-6	5000 ft from HHD	-32480	-32497	-18	-0.0005
3-7	10,000 ft HHD	-8203	-8232	-28	-0.0008
Reach 3 average		-4683	-4980	-297	-0.0086
Overall average		**42411**	**33553**	**-8858**	**-0.0180**

cfd = cubic feet per day.

The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/d.

* Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table D35. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 2 analysis: low net recharge and head boundary conditions, high pumping, low L2-1 K, high L3A K, and high L3B-2 K.

X-section ID	Description	Run 35 vs. Run 83		Difference	Unit Difference*
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cfd/ft
1-1	50 ft from HHD	109322	97326	-11996	-0.0343
1-2	100 ft from HHD	115239	98318	-16921	-0.0484
1-3	200 ft from HHD	127335	100506	-26829	-0.0767
1-4	500 ft from HHD	137542	109775	-27767	-0.0794
1-5	1000 ft from HHD	118136	90397	-27739	-0.0793
1-6	5000 ft from HHD	99953	74616	-25338	-0.0724
1-7	10,000 ft HHD	68423	46003	-22420	-0.0641
Reach 1 average		110850	88134	-22716	-0.0649
2-1	50 ft from HHD	42003	14568	-27435	-0.2532
2-2	100 ft from HHD	42958	17805	-25153	-0.2322
2-3	200 ft from HHD	38984	17903	-21081	-0.1946
2-4	500 ft from HHD	30929	17132	-13797	-0.1273
2-5	1000 ft from HHD	28630	17579	-11051	-0.1020
2-6	5000 ft from HHD	14025	11079	-2946	-0.0272
2-7	10,000 ft HHD	-1494	-3022	-1528	-0.0141
Reach 2 average		28005	13292	-14713	-0.1358
3-1	50 ft from HHD	1040	62	-978	-0.0282
3-2	100 ft from HHD	536	144	-392	-0.0113
3-3	200 ft from HHD	-1966	-1932	34	0.0010
3-4	500 ft from HHD	-6551	-6497	54	0.0016
3-5	1000 ft from HHD	-23930	-24019	-89	-0.0026
3-6	5000 ft from HHD	-55115	-55279	-164	-0.0047
3-7	10,000 ft HHD	-20982	-21370	-388	-0.0112
Reach 3 average		-15281	-15556	-275	-0.0079
Overall average		**123574**	**85870**	**-37704**	**-0.0765**

cfd = cubic feet per day.

The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/d.

* Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table D36. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 2 analysis: low net recharge and head boundary conditions, high pumping, low L2-1 K, low L3A K, and high L3B-2 K.

X-section ID	Description	Run 36 vs. Run 84		Difference	Unit Difference*
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cfd/ft
1-1	50 ft from HHD	67941	64406	-3535	-0.0101
1-2	100 ft from HHD	69464	64781	-4683	-0.0134
1-3	200 ft from HHD	69663	63635	-6028	-0.0172
1-4	500 ft from HHD	72106	66169	-5937	-0.0170
1-5	1000 ft from HHD	50383	44525	-5859	-0.0167
1-6	5000 ft from HHD	53697	48025	-5672	-0.0162
1-7	10,000 ft HHD	36101	30841	-5260	-0.0150
Reach 1 average		59908	54626	-5282	-0.0151
2-1	50 ft from HHD	5429	-543	-5972	-0.0551
2-2	100 ft from HHD	5664	447	-5217	-0.0482
2-3	200 ft from HHD	4334	263	-4071	-0.0376
2-4	500 ft from HHD	2304	68	-2236	-0.0206
2-5	1000 ft from HHD	2065	689	-1376	-0.0127
2-6	5000 ft from HHD	-1465	-2057	-592	-0.0055
2-7	10,000 ft HHD	-7922	-8461	-539	-0.0050
Reach 2 average		1487	-1370	-2857	-0.0264
3-1	50 ft from HHD	355	-123	-478	-0.0138
3-2	100 ft from HHD	281	54	-226	-0.0065
3-3	200 ft from HHD	-296	-337	-41	-0.0012
3-4	500 ft from HHD	-1027	-1026	1	0.0000
3-5	1000 ft from HHD	-9708	-9716	-8	-0.0002
3-6	5000 ft from HHD	-43159	-43175	-16	-0.0005
3-7	10,000 ft HHD	-15137	-15192	-56	-0.0016
Reach 3 average		-9813	-9931	-118	-0.0034
Overall average		**51582**	**43325**	**-8257**	**-0.0168**

cfd = cubic feet per day.

The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/d.

* Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table D37. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 2 analysis: low net recharge and head boundary conditions, high pumping, high L2-1 K, high L3A K, and low L3B-2 K.

X-section ID	Description	Run 37 vs. Run 85		Difference	Unit Difference*
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cfd/ft
1-1	50 ft from HHD	65500	42080	-23421	-0.0670
1-2	100 ft from HHD	73174	42297	-30877	-0.0883
1-3	200 ft from HHD	95916	54387	-41528	-0.1187
1-4	500 ft from HHD	117377	76325	-41052	-0.1174
1-5	1000 ft from HHD	98022	60596	-37426	-0.1070
1-6	5000 ft from HHD	84805	53289	-31516	-0.0901
1-7	10,000 ft HHD	63063	36464	-26599	-0.0760
Reach 1 average		85408	52205	-33203	-0.0949
2-1	50 ft from HHD	55071	23650	-31420	-0.2900
2-2	100 ft from HHD	60611	26916	-33695	-0.3110
2-3	200 ft from HHD	59302	28090	-31212	-0.2881
2-4	500 ft from HHD	54051	29141	-24911	-0.2299
2-5	1000 ft from HHD	59781	36044	-23738	-0.2191
2-6	5000 ft from HHD	25874	14378	-11496	-0.1061
2-7	10,000 ft HHD	1594	-8443	-10038	-0.0926
Reach 2 average		45184	21396	-23787	-0.2196
3-1	50 ft from HHD	7403	-248	-7651	-0.2206
3-2	100 ft from HHD	8945	562	-8383	-0.2417
3-3	200 ft from HHD	6848	1646	-5202	-0.1500
3-4	500 ft from HHD	9132	4219	-4913	-0.1417
3-5	1000 ft from HHD	6202	1796	-4406	-0.1271
3-6	5000 ft from HHD	-28790	-31463	-2674	-0.0771
3-7	10,000 ft HHD	-7151	-9779	-2627	-0.0758
Reach 3 average		370	-4753	-5122	-0.1477
Overall average		130961	68849	-62112	-0.1260

cfd = cubic feet per day.

The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/d.

* Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table D38. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 2 analysis: low net recharge and head boundary conditions, high pumping, high L2-1 K, low L3A K, and low L3B-2 K.

X-section ID	Description	Run 38 vs. Run 86		Difference	Unit Difference*
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cfd/ft
1-1	50 ft from HHD	26881	20754	-6127	-0.0175
1-2	100 ft from HHD	29409	21155	-8254	-0.0236
1-3	200 ft from HHD	36564	26588	-9975	-0.0285
1-4	500 ft from HHD	46996	37492	-9504	-0.0272
1-5	1000 ft from HHD	7256	-1321	-8577	-0.0245
1-6	5000 ft from HHD	35818	27974	-7843	-0.0224
1-7	10,000 ft HHD	27425	20214	-7211	-0.0206
Reach 1 average		30050	21837	-8213	-0.0235
2-1	50 ft from HHD	-7159	-15280	-8121	-0.0750
2-2	100 ft from HHD	-6185	-13931	-7746	-0.0715
2-3	200 ft from HHD	-7048	-13578	-6530	-0.0603
2-4	500 ft from HHD	-9030	-13347	-4316	-0.0398
2-5	1000 ft from HHD	-7787	-11069	-3283	-0.0303
2-6	5000 ft from HHD	-18206	-20244	-2038	-0.0188
2-7	10,000 ft HHD	-30055	-32024	-1969	-0.0182
Reach 2 average		-12210	-17068	-4858	-0.0448
3-1	50 ft from HHD	1568	-16	-1584	-0.0457
3-2	100 ft from HHD	1973	421	-1552	-0.0448
3-3	200 ft from HHD	1663	874	-789	-0.0227
3-4	500 ft from HHD	2425	1951	-474	-0.0137
3-5	1000 ft from HHD	691	424	-267	-0.0077
3-6	5000 ft from HHD	-34145	-34254	-110	-0.0032
3-7	10,000 ft HHD	-13285	-13440	-155	-0.0045
Reach 3 average		-5587	-6292	-704	-0.0203
Overall average		**12252**	**-1522**	**-13775**	**-0.0280**

cfd = cubic feet per day.

The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/d.

* Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table D39. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 2 analysis: low net recharge and head boundary conditions, high pumping, low L2-1 K, high L3A K, and low L3B-2 K.

X-section ID	Description	Run 39 vs. Run 87		Difference	Unit Difference*
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cfd/ft
1-1	50 ft from HHD	101888	65946	-35943	-0.1028
1-2	100 ft from HHD	108832	66224	-42608	-0.1218
1-3	200 ft from HHD	125312	73627	-51684	-0.1478
1-4	500 ft from HHD	142728	92777	-49951	-0.1428
1-5	1000 ft from HHD	117125	73182	-43943	-0.1256
1-6	5000 ft from HHD	99859	64444	-35414	-0.1012
1-7	10,000 ft HHD	69237	40637	-28601	-0.0818
Reach 1 average		109283	68120	-41163	-0.1177
2-1	50 ft from HHD	48215	17042	-31173	-0.2877
2-2	100 ft from HHD	49747	20093	-29654	-0.2737
2-3	200 ft from HHD	45818	20970	-24848	-0.2294
2-4	500 ft from HHD	37097	20680	-16417	-0.1515
2-5	1000 ft from HHD	35940	22246	-13694	-0.1264
2-6	5000 ft from HHD	15229	11035	-4194	-0.0387
2-7	10,000 ft HHD	-7122	-9800	-2678	-0.0247
Reach 2 average		32132	14609	-17523	-0.1617
3-1	50 ft from HHD	1975	99	-1876	-0.0541
3-2	100 ft from HHD	1717	101	-1616	-0.0466
3-3	200 ft from HHD	-832	-813	19	0.0005
3-4	500 ft from HHD	-4601	-4777	-176	-0.0051
3-5	1000 ft from HHD	-18845	-20168	-1322	-0.0381
3-6	5000 ft from HHD	-50645	-52501	-1856	-0.0535
3-7	10,000 ft HHD	-19167	-23809	-4642	-0.1339
Reach 3 average		-12914	-14552	-1638	-0.0473
Overall average		128501	68177	-60324	-0.1224

cfd = cubic feet per day.

The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/d.

* Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table D40. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 2 analysis: low net recharge and head boundary conditions, high pumping, low L2-1 K, low L3A K, and low L3B-2 K.

X-section ID	Description	Run 40 vs. Run 88		Difference	Unit Difference*
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cfd/ft
1-1	50 ft from HHD	43724	34924	-8800	-0.0252
1-2	100 ft from HHD	46021	35348	-10673	-0.0305
1-3	200 ft from HHD	50185	38152	-12033	-0.0344
1-4	500 ft from HHD	58563	47417	-11146	-0.0319
1-5	1000 ft from HHD	14668	5166	-9501	-0.0272
1-6	5000 ft from HHD	41959	33649	-8310	-0.0238
1-7	10,000 ft HHD	30229	22741	-7487	-0.0214
Reach 1 average		40764	31057	-9707	-0.0278
2-1	50 ft from HHD	-10423	-18536	-8113	-0.0749
2-2	100 ft from HHD	-9925	-17289	-7364	-0.0680
2-3	200 ft from HHD	-11178	-17123	-5945	-0.0549
2-4	500 ft from HHD	-13576	-17098	-3522	-0.0325
2-5	1000 ft from HHD	-12946	-15328	-2382	-0.0220
2-6	5000 ft from HHD	-20883	-22094	-1211	-0.0112
2-7	10,000 ft HHD	-32064	-33204	-1140	-0.0105
Reach 2 average		-15856	-20096	-4240	-0.0391
3-1	50 ft from HHD	925	27	-899	-0.0259
3-2	100 ft from HHD	1078	232	-847	-0.0244
3-3	200 ft from HHD	635	269	-366	-0.0106
3-4	500 ft from HHD	830	620	-210	-0.0060
3-5	1000 ft from HHD	-5092	-5234	-142	-0.0041
3-6	5000 ft from HHD	-40126	-40238	-112	-0.0032
3-7	10,000 ft HHD	-17496	-17921	-425	-0.0123
Reach 3 average		-8464	-8892	-429	-0.0124
Overall average		**16444**	**2069**	**-14375**	**-0.0292**

cfd = cubic feet per day.

The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/d.

* Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table D41. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 2 analysis: low net recharge and head boundary conditions, low pumping, high L2-1 K, high L3A K, and high L3B-2 K.

X-section ID	Description	Run 41 vs. Run 89		Difference	Unit Difference*
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cfd/ft
1-1	50 ft from HHD	-2957	-3920	-963	-0.0028
1-2	100 ft from HHD	195	-4309	-4504	-0.0129
1-3	200 ft from HHD	11292	1128	-10164	-0.0291
1-4	500 ft from HHD	12424	1588	-10836	-0.0310
1-5	1000 ft from HHD	10636	-497	-11134	-0.0318
1-6	5000 ft from HHD	11185	929	-10255	-0.0293
1-7	10,000 ft HHD	10891	1620	-9271	-0.0265
Reach 1 average		7666	-495	-8161	-0.0233
2-1	50 ft from HHD	13650	-302	-13952	-0.1288
2-2	100 ft from HHD	18773	3716	-15057	-0.1390
2-3	200 ft from HHD	19927	5462	-14466	-0.1335
2-4	500 ft from HHD	19327	7798	-11529	-0.1064
2-5	1000 ft from HHD	23955	13631	-10325	-0.0953
2-6	5000 ft from HHD	7290	1275	-6015	-0.0555
2-7	10,000 ft HHD	6309	911	-5397	-0.0498
Reach 2 average		15604	4641	-10963	-0.1012
3-1	50 ft from HHD	6222	1247	-4975	-0.1435
3-2	100 ft from HHD	7555	5191	-2364	-0.0682
3-3	200 ft from HHD	5645	4954	-691	-0.0199
3-4	500 ft from HHD	8281	7897	-384	-0.0111
3-5	1000 ft from HHD	8811	8490	-320	-0.0092
3-6	5000 ft from HHD	6049	5862	-187	-0.0054
3-7	10,000 ft HHD	2402	2277	-125	-0.0036
Reach 3 average		6423	5131	-1292	-0.0373
Overall average		**29694**	**9278**	**-20416**	**-0.0414**

cfd = cubic feet per day.

The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/d.

* Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table D42. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 2 analysis: low net recharge and head boundary conditions, low pumping, high L2-1 K, low L3A K, and high L3B-2 K.

X-section ID	Description	Run 42 vs. Run 90		Difference	Unit Difference*
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cfd/ft
1-1	50 ft from HHD	274	2	-271	-0.0008
1-2	100 ft from HHD	878	-58	-935	-0.0027
1-3	200 ft from HHD	2566	978	-1588	-0.0045
1-4	500 ft from HHD	1867	253	-1614	-0.0046
1-5	1000 ft from HHD	-485	-2119	-1633	-0.0047
1-6	5000 ft from HHD	1232	-357	-1589	-0.0045
1-7	10,000 ft HHD	1385	-87	-1472	-0.0042
Reach 1 average		1102	-198	-1301	-0.0037
2-1	50 ft from HHD	220	-2004	-2225	-0.0205
2-2	100 ft from HHD	1223	-1238	-2461	-0.0227
2-3	200 ft from HHD	1405	-959	-2364	-0.0218
2-4	500 ft from HHD	1359	-431	-1790	-0.0165
2-5	1000 ft from HHD	2367	882	-1484	-0.0137
2-6	5000 ft from HHD	-632	-1804	-1172	-0.0108
2-7	10,000 ft HHD	-78	-1230	-1152	-0.0106
Reach 2 average		838	-969	-1807	-0.0167
3-1	50 ft from HHD	1296	182	-1114	-0.0321
3-2	100 ft from HHD	1566	1028	-538	-0.0155
3-3	200 ft from HHD	1218	1091	-128	-0.0037
3-4	500 ft from HHD	1525	1499	-27	-0.0008
3-5	1000 ft from HHD	2368	2350	-18	-0.0005
3-6	5000 ft from HHD	1929	1917	-12	-0.0003
3-7	10,000 ft HHD	1165	1153	-13	-0.0004
Reach 3 average		1581	1317	-264	-0.0076
Overall average		**3521**	**150**	**-3371**	**-0.0068**

cfd = cubic feet per day.

The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/d.

* Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table D43. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 2 analysis: low net recharge and head boundary conditions, low pumping, low L2-1 K, high L3A K, and high L3B-2 K.

X-section ID	Description	Run 43 vs. Run 91		Difference	Unit Difference*
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cfd/ft
1-1	50 ft from HHD	-12187	-12853	-666	-0.0019
1-2	100 ft from HHD	-9141	-13200	-4059	-0.0116
1-3	200 ft from HHD	3054	-6293	-9347	-0.0267
1-4	500 ft from HHD	5512	-4536	-10048	-0.0287
1-5	1000 ft from HHD	6253	-4152	-10405	-0.0297
1-6	5000 ft from HHD	8933	-658	-9591	-0.0274
1-7	10,000 ft HHD	10409	1762	-8647	-0.0247
Reach 1 average		1833	-5704	-7538	-0.0215
2-1	50 ft from HHD	14583	4271	-10312	-0.0952
2-2	100 ft from HHD	14844	5252	-9592	-0.0885
2-3	200 ft from HHD	12747	4285	-8462	-0.0781
2-4	500 ft from HHD	8080	2532	-5548	-0.0512
2-5	1000 ft from HHD	6468	2173	-4295	-0.0396
2-6	5000 ft from HHD	-872	-1420	-547	-0.0051
2-7	10,000 ft HHD	-2391	-2333	58	0.0005
Reach 2 average		7637	2109	-5528	-0.0510
3-1	50 ft from HHD	-468	-175	293	0.0084
3-2	100 ft from HHD	-1133	-1020	114	0.0033
3-3	200 ft from HHD	-3226	-3083	143	0.0041
3-4	500 ft from HHD	-5519	-5438	81	0.0023
3-5	1000 ft from HHD	-12335	-12273	61	0.0018
3-6	5000 ft from HHD	-11567	-11526	41	0.0012
3-7	10,000 ft HHD	-11152	-11090	63	0.0018
Reach 3 average		-6486	-6372	114	0.0033
Overall average		**2984**	**-9968**	**-12952**	**-0.0263**

cfd = cubic feet per day.

The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/d.

* Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table D44. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 2 analysis: low net recharge and head boundary conditions, low pumping, low L2-1 K, low L3A K, and high L3B-2 K.

X-section ID	Description	Run 44 vs. Run 92		Difference	Unit Difference*
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cfd/ft
1-1	50 ft from HHD	-4367	-4584	-217	-0.0006
1-2	100 ft from HHD	-3736	-4616	-880	-0.0025
1-3	200 ft from HHD	-1467	-2984	-1516	-0.0043
1-4	500 ft from HHD	-1575	-3129	-1554	-0.0044
1-5	1000 ft from HHD	-2546	-4133	-1587	-0.0045
1-6	5000 ft from HHD	435	-1113	-1548	-0.0044
1-7	10,000 ft HHD	1371	-64	-1435	-0.0041
Reach 1 average		-1698	-2946	-1248	-0.0036
2-1	50 ft from HHD	524	-1153	-1678	-0.0155
2-2	100 ft from HHD	667	-908	-1575	-0.0145
2-3	200 ft from HHD	217	-1164	-1382	-0.0128
2-4	500 ft from HHD	-598	-1414	-816	-0.0075
2-5	1000 ft from HHD	-667	-1185	-518	-0.0048
2-6	5000 ft from HHD	-2130	-2358	-227	-0.0021
2-7	10,000 ft HHD	-1654	-1861	-207	-0.0019
Reach 2 average		-520	-1435	-915	-0.0084
3-1	50 ft from HHD	42	-142	-184	-0.0053
3-2	100 ft from HHD	2	-98	-100	-0.0029
3-3	200 ft from HHD	-407	-422	-15	-0.0004
3-4	500 ft from HHD	-800	-799	1	0.0000
3-5	1000 ft from HHD	-3476	-3476	0	0.0000
3-6	5000 ft from HHD	-3606	-3607	-1	0.0000
3-7	10,000 ft HHD	-4085	-4084	1	0.0000
Reach 3 average		-1761	-1804	-43	-0.0012
Overall average		**-3979**	**-6185**	**-2205**	**-0.0045**

cfd = cubic feet per day.

The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/d.

* Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table D45. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 2 analysis: low net recharge and head boundary conditions, low pumping, high L2-1 K, high L3A K, and low L3B-2 K.

X-section ID	Description	Run 45 vs. Run 93		Difference	Unit Difference*
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cfd/ft
1-1	50 ft from HHD	-1242	-1332	-89	-0.0003
1-2	100 ft from HHD	1758	-1500	-3257	-0.0093
1-3	200 ft from HHD	12072	2894	-9178	-0.0262
1-4	500 ft from HHD	12394	2508	-9886	-0.0283
1-5	1000 ft from HHD	10979	897	-10082	-0.0288
1-6	5000 ft from HHD	11148	1838	-9311	-0.0266
1-7	10,000 ft HHD	10504	1809	-8696	-0.0249
Reach 1 average		8230	1016	-7214	-0.0206
2-1	50 ft from HHD	12952	1529	-11424	-0.1054
2-2	100 ft from HHD	18434	2672	-15762	-0.1455
2-3	200 ft from HHD	19838	3168	-16670	-0.1539
2-4	500 ft from HHD	19622	4077	-15546	-0.1435
2-5	1000 ft from HHD	24431	8376	-16055	-0.1482
2-6	5000 ft from HHD	7946	-1299	-9245	-0.0853
2-7	10,000 ft HHD	7593	-1093	-8686	-0.0802
Reach 2 average		15831	2490	-13341	-0.1231
3-1	50 ft from HHD	6734	-184	-6918	-0.1995
3-2	100 ft from HHD	8161	536	-7624	-0.2199
3-3	200 ft from HHD	6200	1517	-4682	-0.1350
3-4	500 ft from HHD	8894	4308	-4586	-0.1323
3-5	1000 ft from HHD	8894	5076	-3817	-0.1101
3-6	5000 ft from HHD	5756	3694	-2061	-0.0594
3-7	10,000 ft HHD	1840	519	-1320	-0.0381
Reach 3 average		6640	2210	-4430	-0.1278
Overall average		**30701**	**5716**	**-24985**	**-0.0507**

cfd = cubic feet per day.

The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/d.

* Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table D46. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 2 analysis: low net recharge and head boundary conditions, low pumping, high L2-1 K, low L3A K, and low L3B-2 K.

X-section ID	Description	Run 46 vs. Run 94		Difference	Unit Difference*
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cfd/ft
1-1	50 ft from HHD	283	75	-208	-0.0006
1-2	100 ft from HHD	820	30	-790	-0.0023
1-3	200 ft from HHD	2170	699	-1471	-0.0042
1-4	500 ft from HHD	1349	-151	-1499	-0.0043
1-5	1000 ft from HHD	636	-842	-1478	-0.0042
1-6	5000 ft from HHD	1320	-100	-1421	-0.0041
1-7	10,000 ft HHD	1299	-29	-1328	-0.0038
Reach 1 average		1125	-45	-1171	-0.0033
2-1	50 ft from HHD	1185	-543	-1728	-0.0159
2-2	100 ft from HHD	2167	-268	-2434	-0.0225
2-3	200 ft from HHD	2308	-301	-2608	-0.0241
2-4	500 ft from HHD	2227	-71	-2298	-0.0212
2-5	1000 ft from HHD	3137	1018	-2119	-0.0196
2-6	5000 ft from HHD	554	-1087	-1641	-0.0151
2-7	10,000 ft HHD	1227	-396	-1623	-0.0150
Reach 2 average		1829	-235	-2065	-0.0191
3-1	50 ft from HHD	1263	-98	-1361	-0.0392
3-2	100 ft from HHD	1472	116	-1355	-0.0391
3-3	200 ft from HHD	1056	374	-682	-0.0197
3-4	500 ft from HHD	1227	789	-438	-0.0126
3-5	1000 ft from HHD	1386	1152	-234	-0.0068
3-6	5000 ft from HHD	883	807	-77	-0.0022
3-7	10,000 ft HHD	89	12	-77	-0.0022
Reach 3 average		1054	450	-604	-0.0174
Overall average		**4008**	**169**	**-3839**	**-0.0078**

cfd = cubic feet per day.

The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/d.

* Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table D47. Cross-sectional flow comparison between "with project" and "with project" runs in Stage 2 analysis: low net recharge and head boundary conditions, low pumping, low L2-1 K, high L3A K, and low L3B-2 K.

X-section ID	Description	Run 47 vs. Run 95		Difference	Unit Difference*
		w/o project, cfd	w/ project, cfd	w/ - w/o, cfd	(w/ - w/o)/L, cfd/ft
1-1	50 ft from HHD	-9019	-6478	2541	0.0073
1-2	100 ft from HHD	-6128	-6590	-462	-0.0013
1-3	200 ft from HHD	5257	-739	-5996	-0.0171
1-4	500 ft from HHD	6816	-212	-7028	-0.0201
1-5	1000 ft from HHD	7720	-407	-8127	-0.0232
1-6	5000 ft from HHD	9617	1412	-8205	-0.0235
1-7	10,000 ft HHD	10375	2522	-7854	-0.0225
Reach 1 average		3520	-1499	-5019	-0.0143
2-1	50 ft from HHD	13958	4122	-9837	-0.0908
2-2	100 ft from HHD	14770	4944	-9826	-0.0907
2-3	200 ft from HHD	13071	5213	-7858	-0.0725
2-4	500 ft from HHD	8959	4274	-4685	-0.0432
2-5	1000 ft from HHD	8058	4333	-3725	-0.0344
2-6	5000 ft from HHD	232	-187	-419	-0.0039
2-7	10,000 ft HHD	-649	-523	126	0.0012
Reach 2 average		8343	3168	-5175	-0.0478
3-1	50 ft from HHD	330	318	-12	-0.0004
3-2	100 ft from HHD	-165	194	359	0.0103
3-3	200 ft from HHD	-2293	-898	1395	0.0402
3-4	500 ft from HHD	-3918	-3173	745	0.0215
3-5	1000 ft from HHD	-8590	-8151	439	0.0127
3-6	5000 ft from HHD	-7929	-7800	129	0.0037
3-7	10,000 ft HHD	-7498	-7110	388	0.0112
Reach 3 average		-4295	-3803	492	0.0142
Overall average		**7568**	**-2134**	**-9702**	**-0.0197**

cfd = cubic feet per day.

The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/d.

* Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Table D48. Cross-sectional flow comparison between "with project" and “with project” runs in Stage 2 analysis: low net recharge and head boundary conditions, low pumping, low L2-1 K, low L3A K, and low L3B-2 K.

X-section ID	Description	Run 48 vs. Run 96		Difference	Unit Difference*
		w/o project	w/ project	(w/ - w/o)	(w/ - w/o)/L, cfd/ft
1-1	50 ft from HHD	-1504	-1447	57	0.0002
1-2	100 ft from HHD	-945	-1463	-518	-0.0015
1-3	200 ft from HHD	843	-332	-1175	-0.0034
1-4	500 ft from HHD	364	-899	-1262	-0.0036
1-5	1000 ft from HHD	344	-1017	-1361	-0.0039
1-6	5000 ft from HHD	1376	11	-1366	-0.0039
1-7	10,000 ft HHD	1584	301	-1283	-0.0037
Reach 1 average		295	-692	-987	-0.0028
2-1	50 ft from HHD	1610	102	-1509	-0.0139
2-2	100 ft from HHD	2028	326	-1703	-0.0157
2-3	200 ft from HHD	1813	285	-1528	-0.0141
2-4	500 ft from HHD	1264	192	-1072	-0.0099
2-5	1000 ft from HHD	1550	699	-851	-0.0079
2-6	5000 ft from HHD	-222	-749	-526	-0.0049
2-7	10,000 ft HHD	365	-143	-508	-0.0047
Reach 2 average		1201	102	-1100	-0.0101
3-1	50 ft from HHD	492	47	-445	-0.0128
3-2	100 ft from HHD	518	111	-407	-0.0117
3-3	200 ft from HHD	103	7	-96	-0.0028
3-4	500 ft from HHD	-23	-118	-95	-0.0027
3-5	1000 ft from HHD	-1474	-1545	-72	-0.0021
3-6	5000 ft from HHD	-1590	-1623	-33	-0.0010
3-7	10,000 ft HHD	-1851	-1882	-31	-0.0009
Reach 3 average		-546	-715	-168	-0.0049
Overall average		950	-1305	-2255	-0.0046

cfd = cubic feet per day.

The low, medium, and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03), (0.3, 0.3, 0.09), and (1, 1, 0.3) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3A are (100, 100, 8), (400, 400, 32), and (600, 600, 48) ft/d.

The low, medium, and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1), (10, 10, 10), and (100, 100, 100) ft/d.

* Unit Difference = Difference/Corresponding Reach Length (L): 349,807 ft for Reach 1, 108,340 ft for Reach 2, 34,675 ft for Reach 3, and 492,822 ft for combined reaches 1, 2, and 3.

Appendix E. Historical Data of Groundwater Head and Canal Water Stage Used for HHD Phase 1A model.

There are 32 figures (Figures E1 through E32) included in this appendix to show the historical data of groundwater head and canal water stage used for HHD Phase 1A mode.

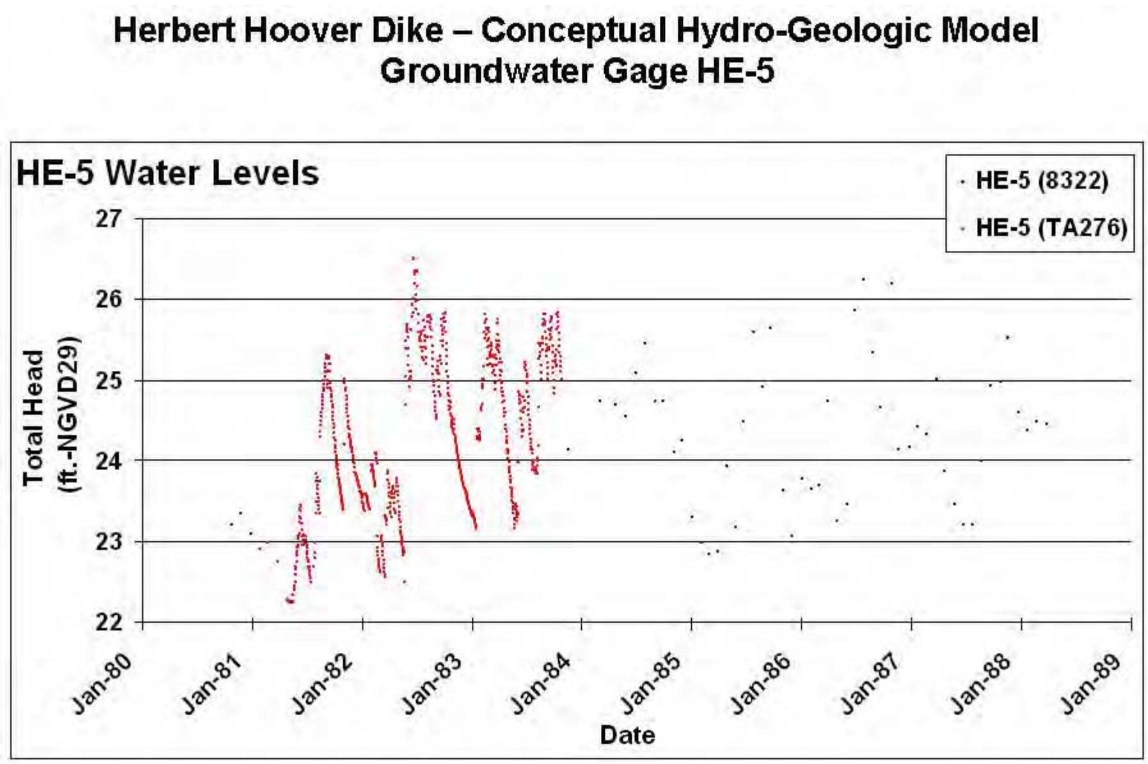


Figure E1. Historical data of groundwater total head at Gage HE-5.

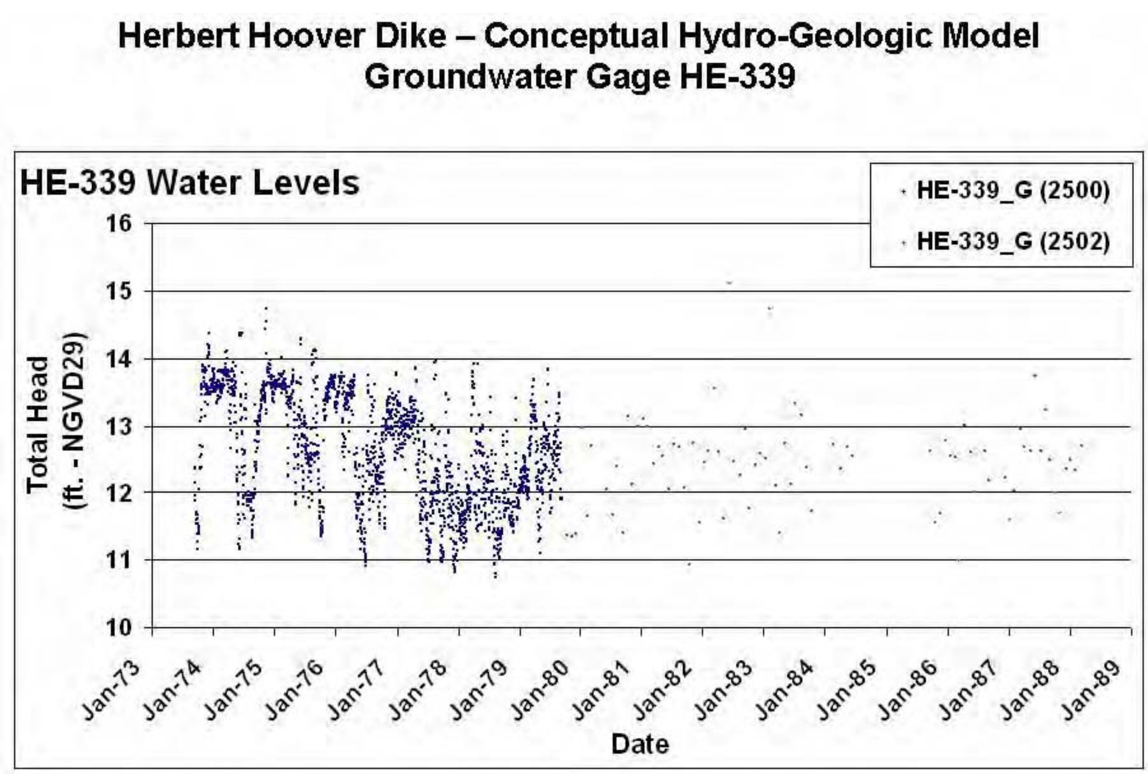


Figure E2. Historical data of groundwater total head at Gage HE-339.

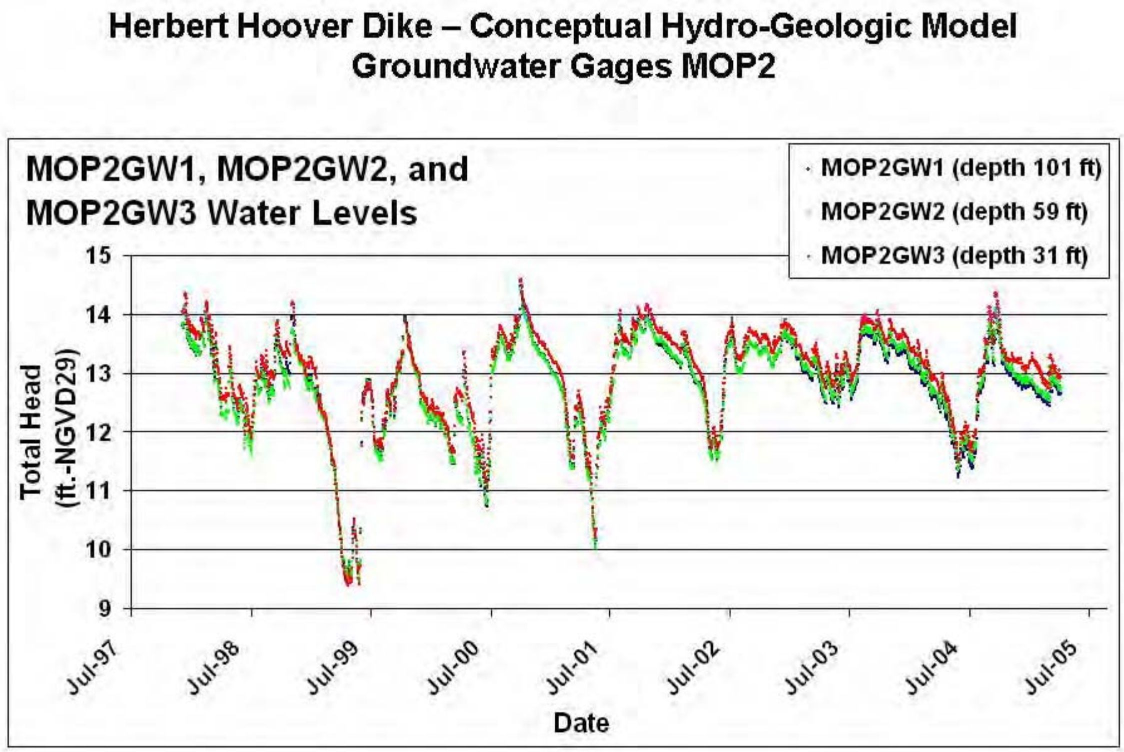


Figure E3. Historical data of groundwater total head at Gage MOP2.

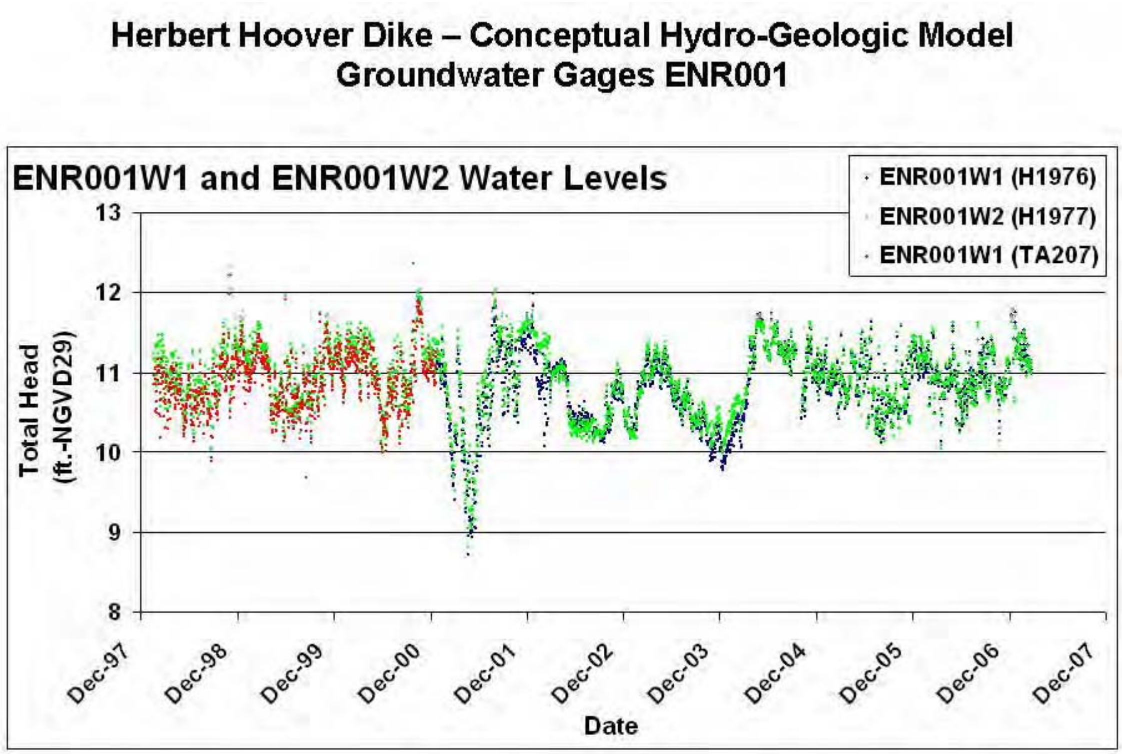


Figure E4. Historical data of groundwater total head at Gage ENR001.

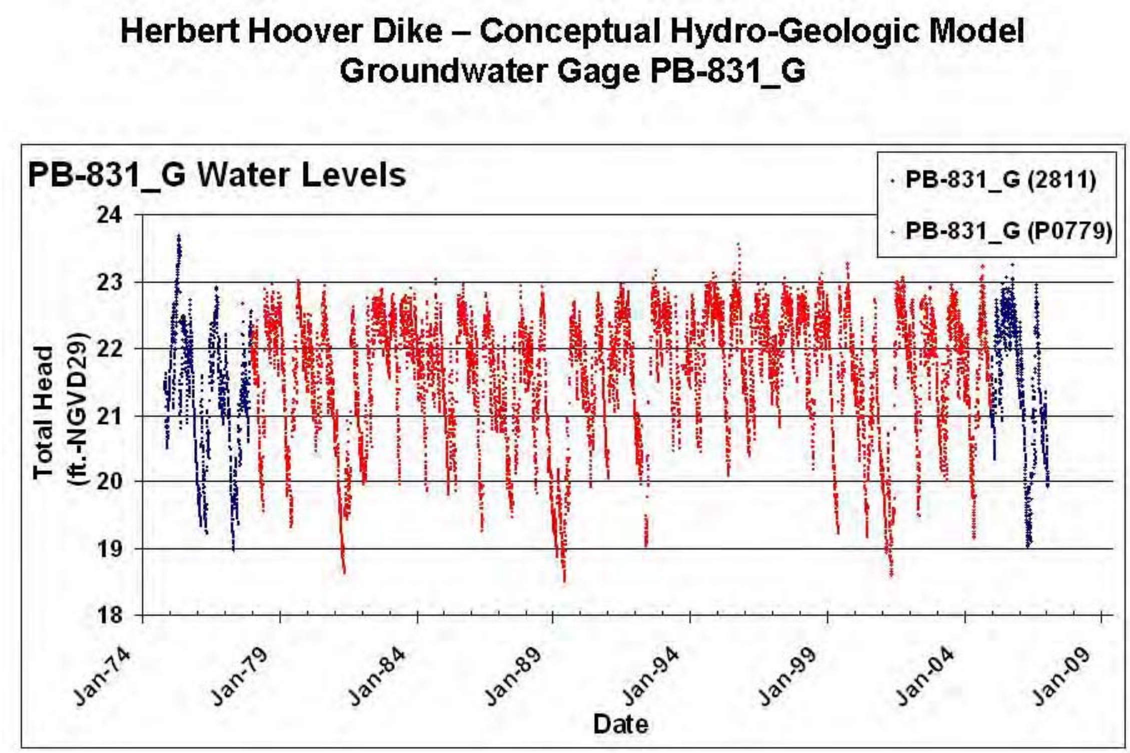


Figure E5. Historical data of groundwater total head at Gage PB-831_G.

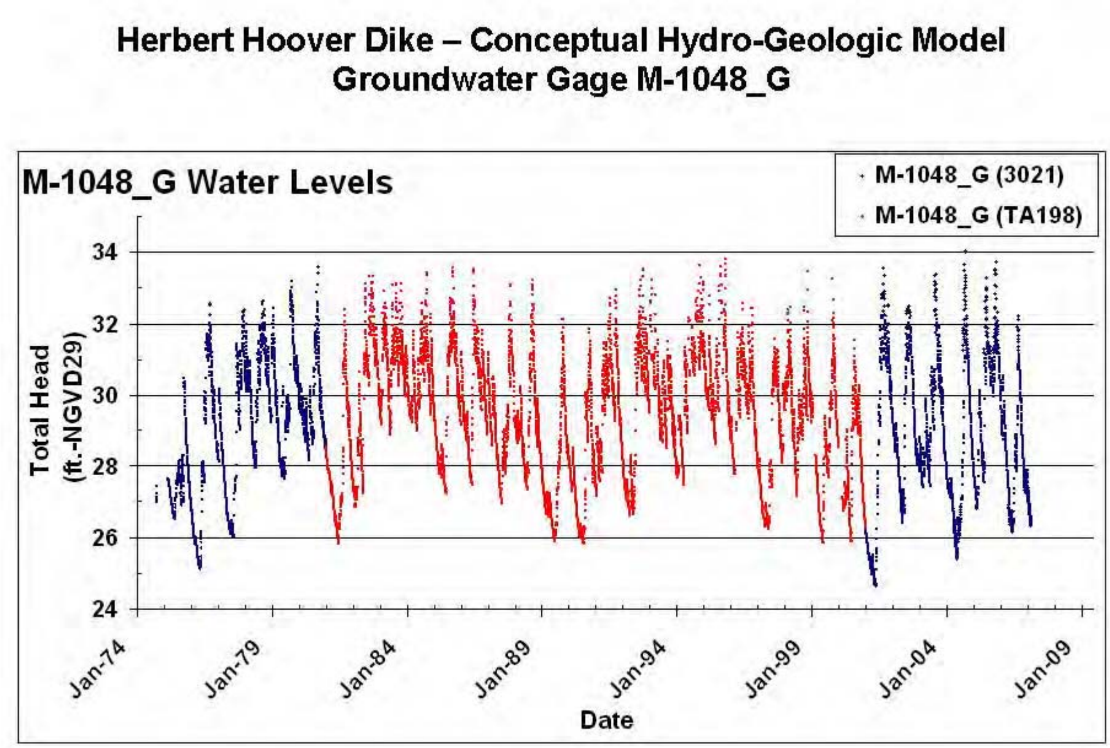


Figure E6. Historical data of groundwater total head at Gage M-1048_G.

Herbert Hoover Dike – Conceptual Hydro-Geologic Model
Groundwater Gage M-928_G

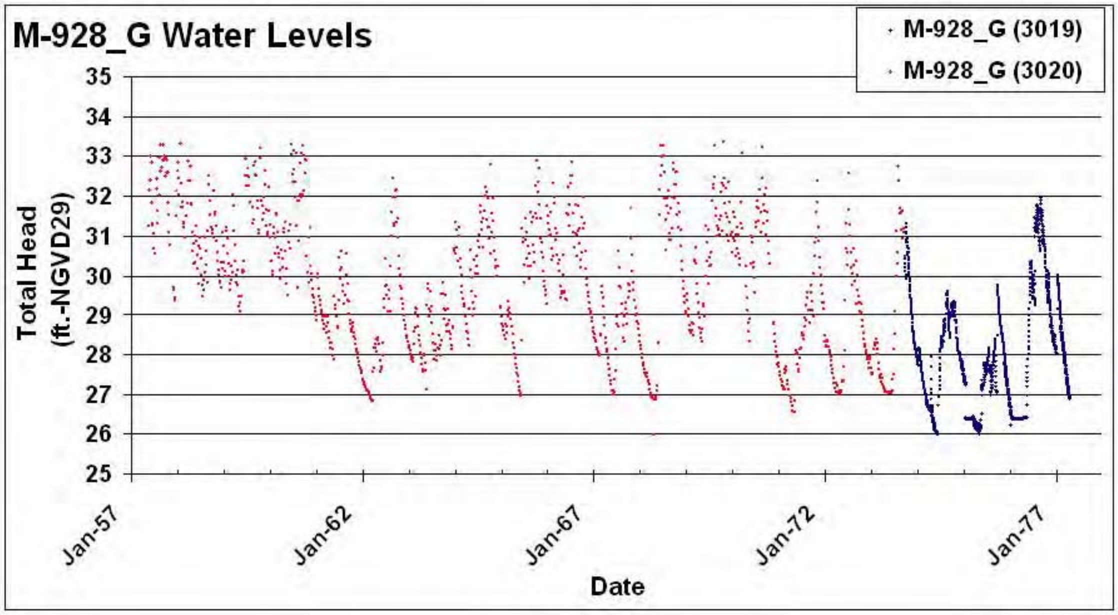


Figure E7. Historical data of groundwater total head at Gage M-928_G.

Herbert Hoover Dike – Conceptual Hydro-Geologic Model
Groundwater Gages CRS02

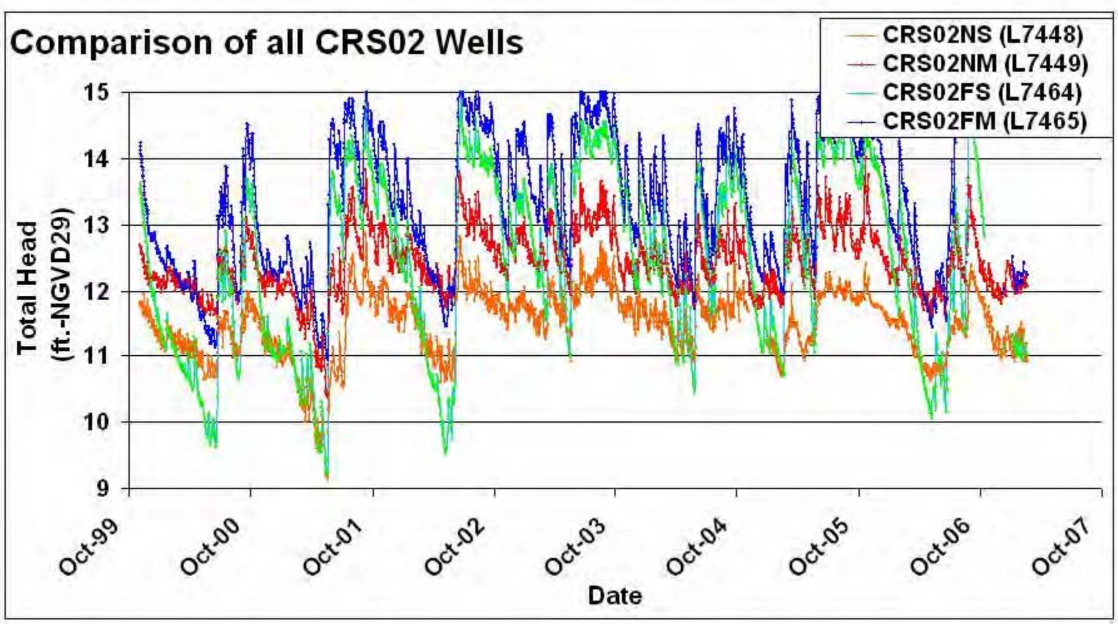


Figure E8. Historical data of groundwater total head at Gage CRS02.

Herbert Hoover Dike – Conceptual Hydro-Geologic Model
Groundwater Gage HE-857_G

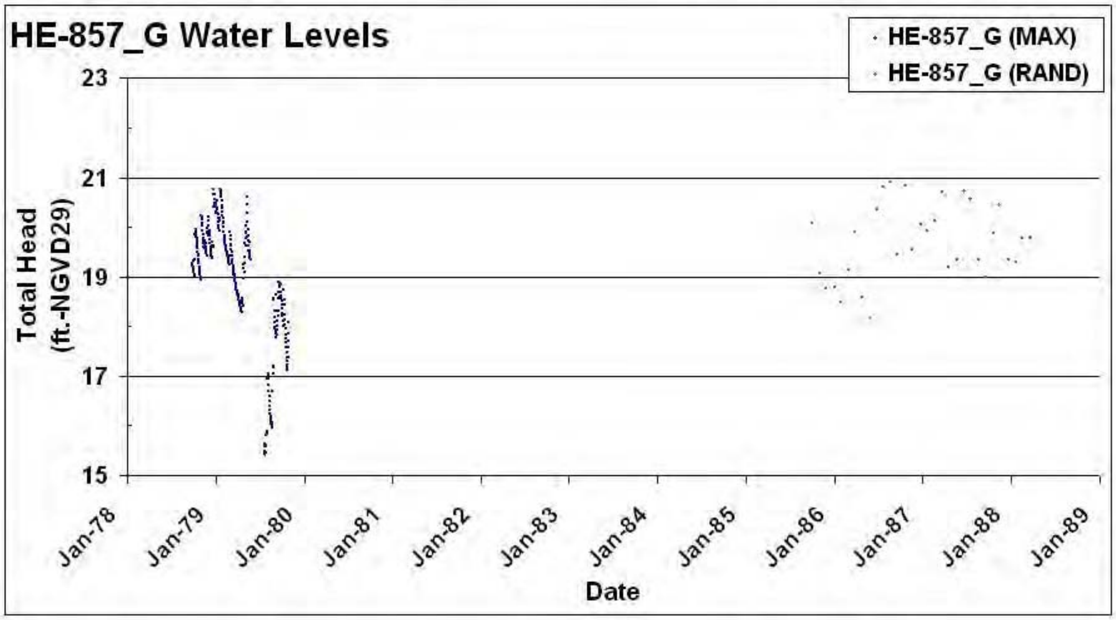


Figure E9. Historical data of groundwater total head at Gage HE-857_G.

Herbert Hoover Dike – Conceptual Hydro-Geologic Model
Groundwater Gage PB-505_G

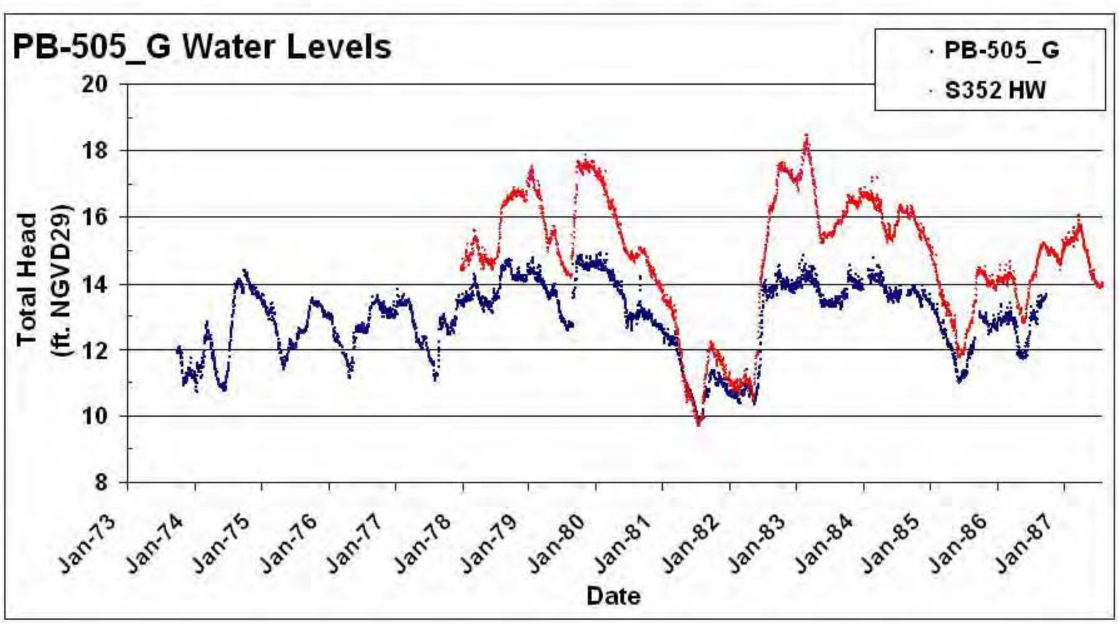


Figure E10. Historical data of groundwater total head at Gage PB-505_G.

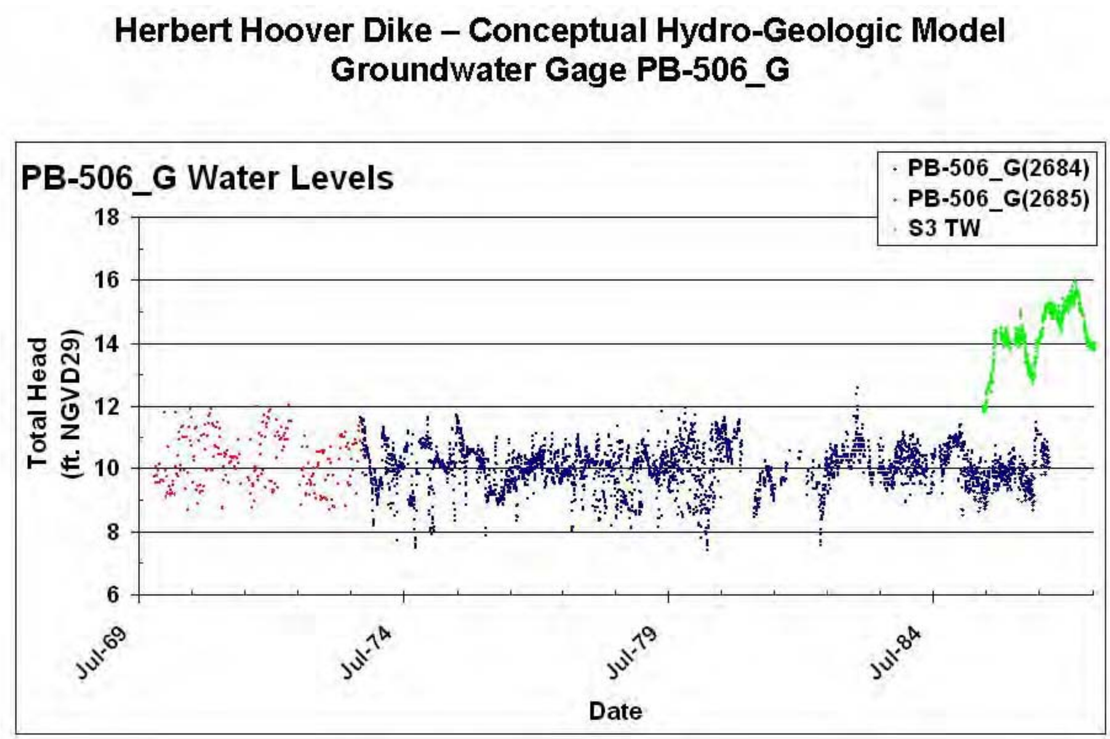


Figure E11. Historical data of groundwater total head at Gage PB-506_G.

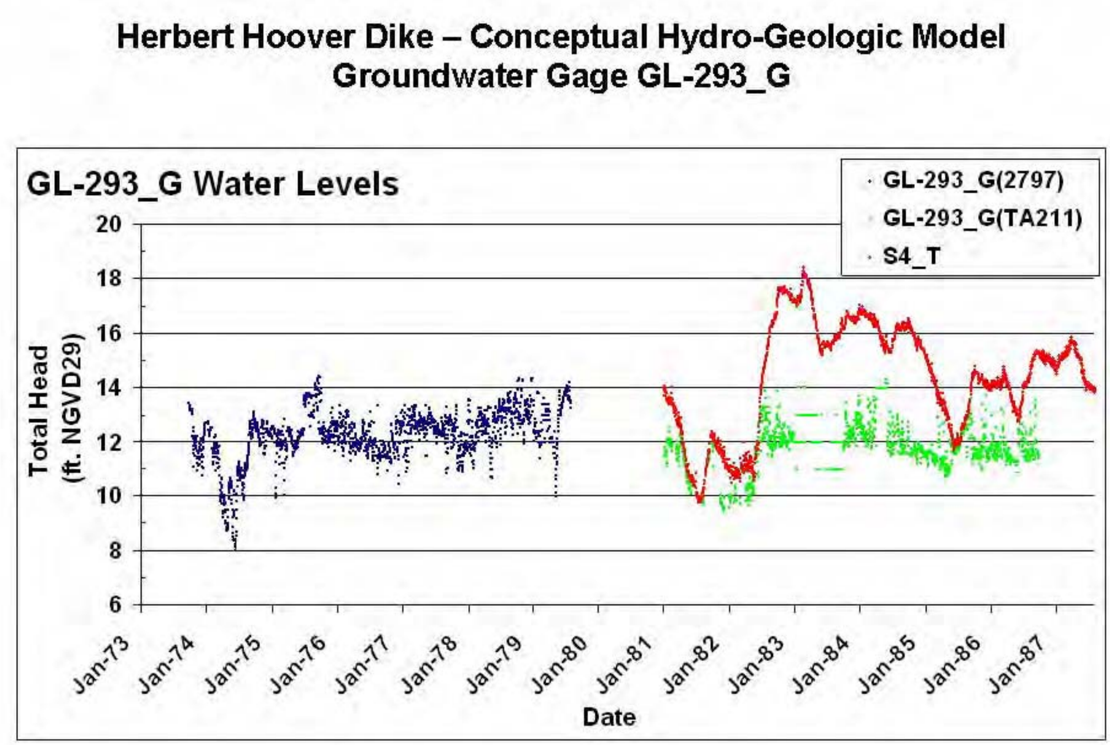


Figure E12. Historical data of groundwater total head at Gage GL-293_G.

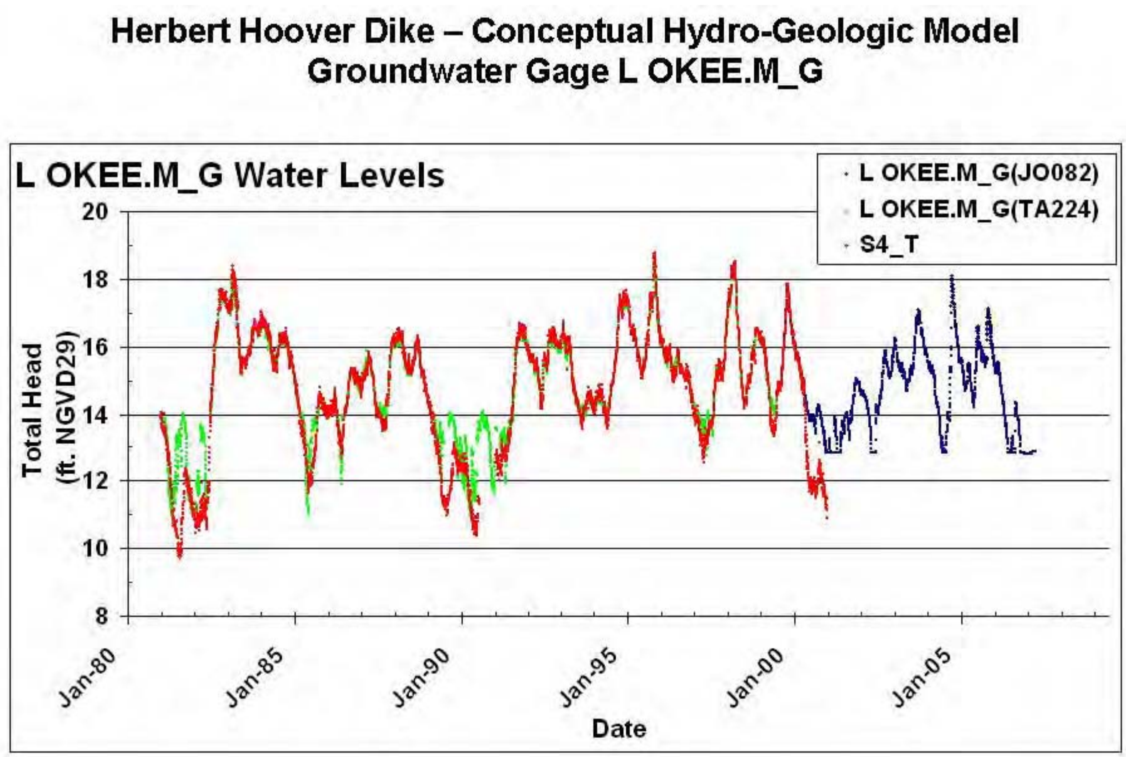


Figure E13. Historical data of groundwater total head at Gage L OKEE.M_G.

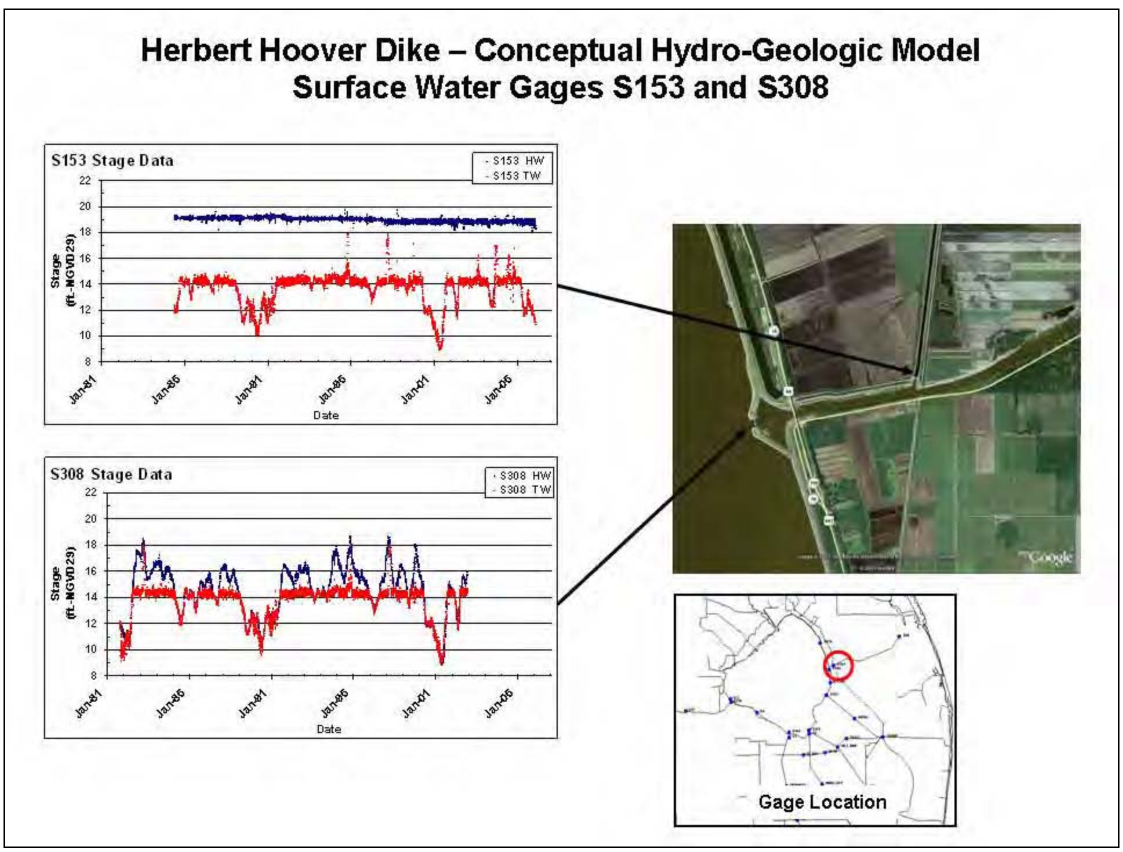


Figure E14. Historical data of canal water stage at Gages S153 and S308.

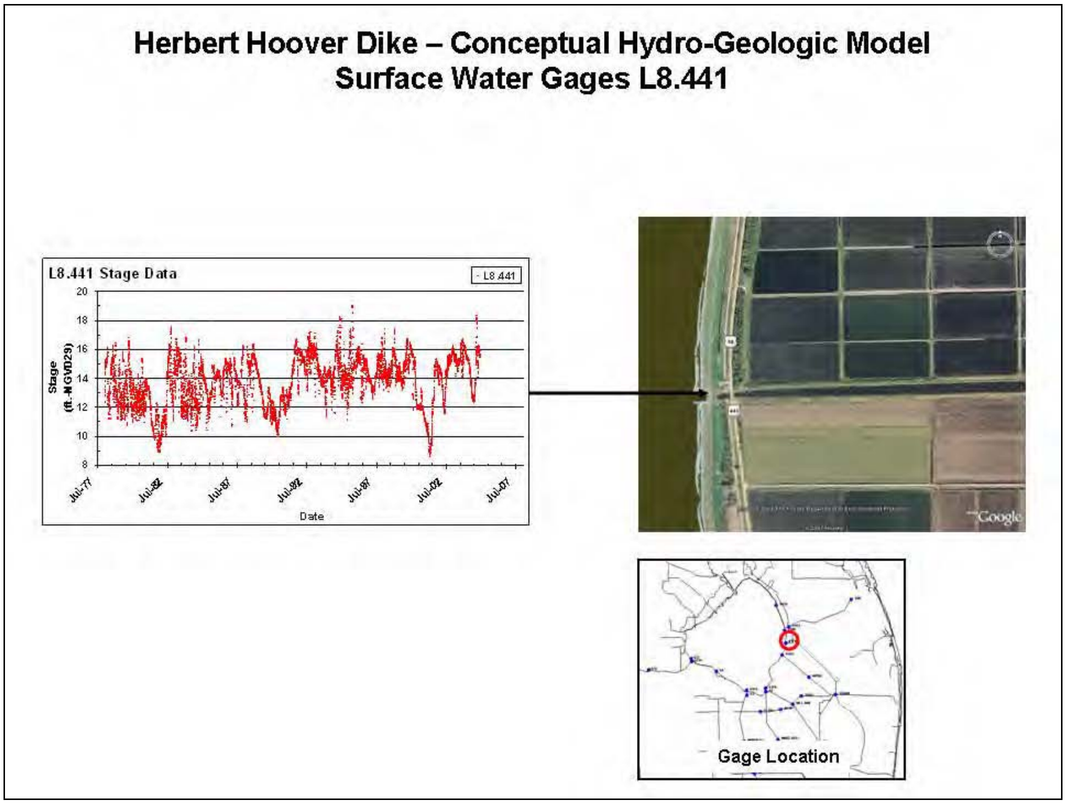


Figure E15. Historical data of canal water stage at Gage L8.441.

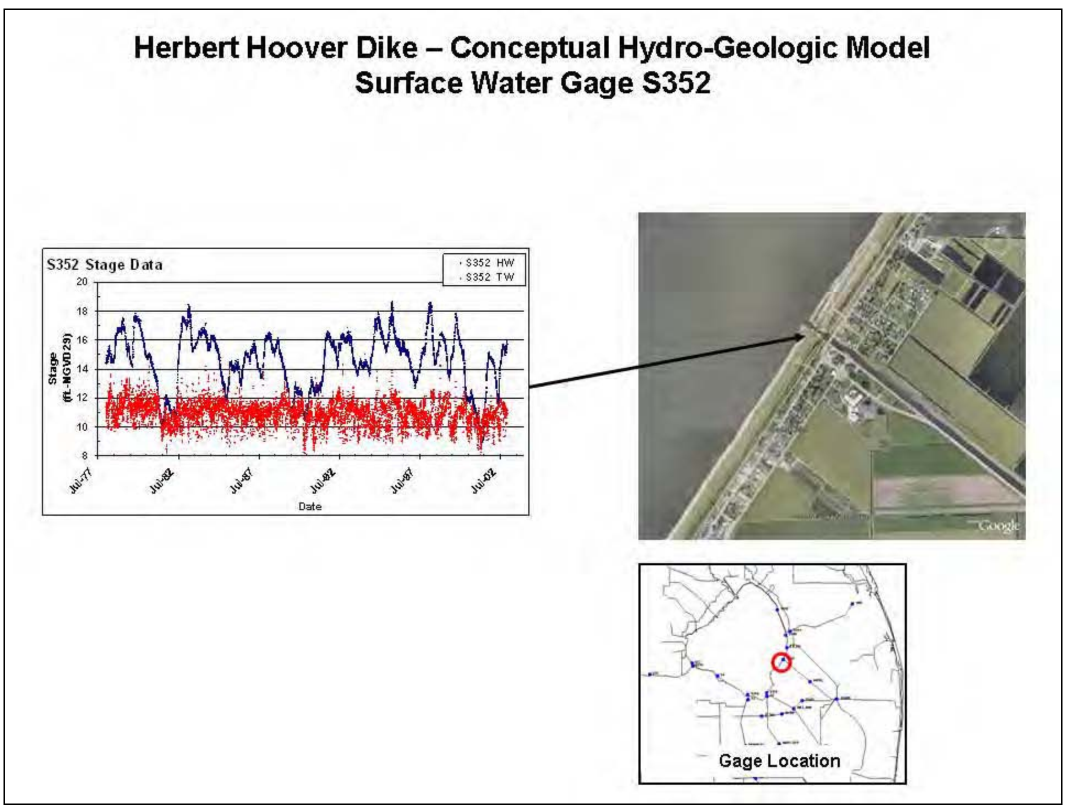


Figure E16. Historical data of canal water stage at Gage S352.

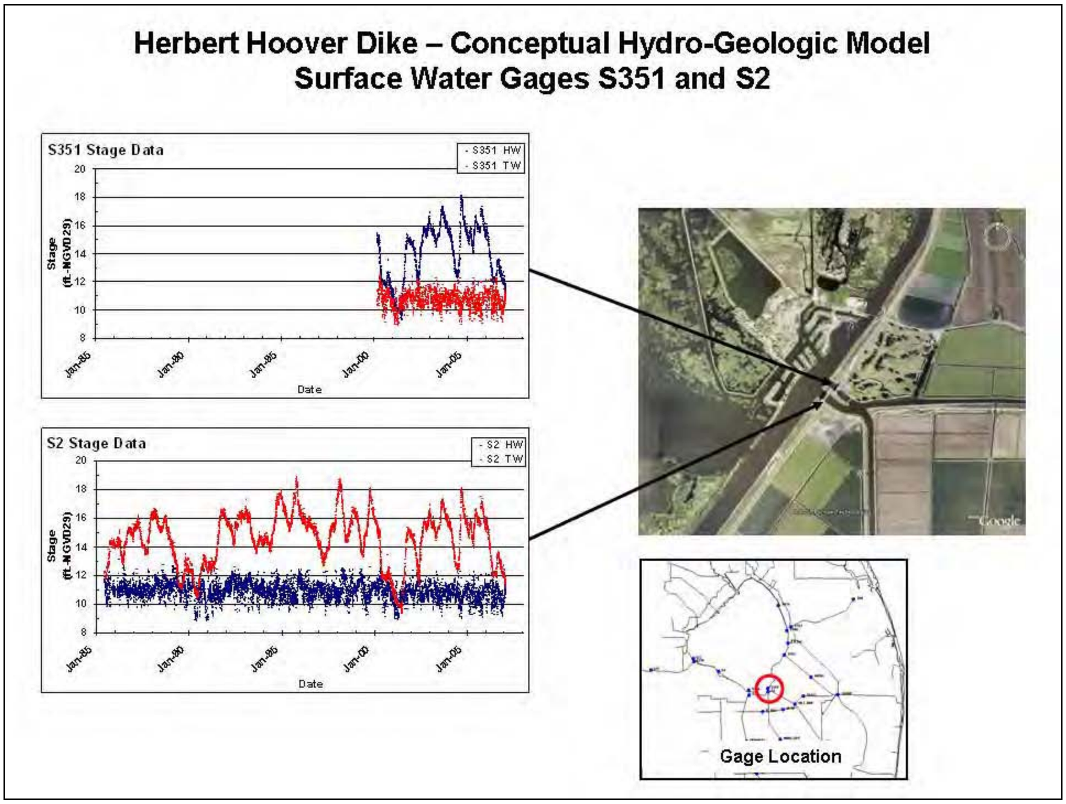


Figure E17. Historical data of canal water stage at Gages S351 and S2.

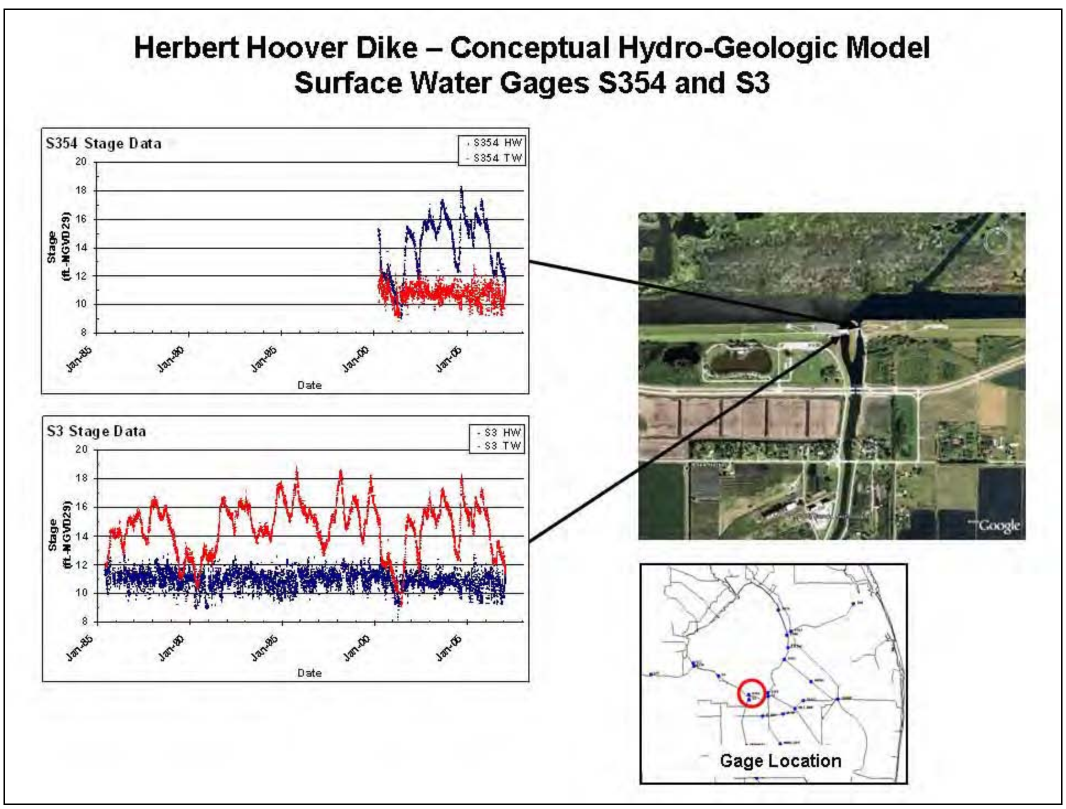


Figure E18. Historical data of canal water stage at Gages S352 and S3.

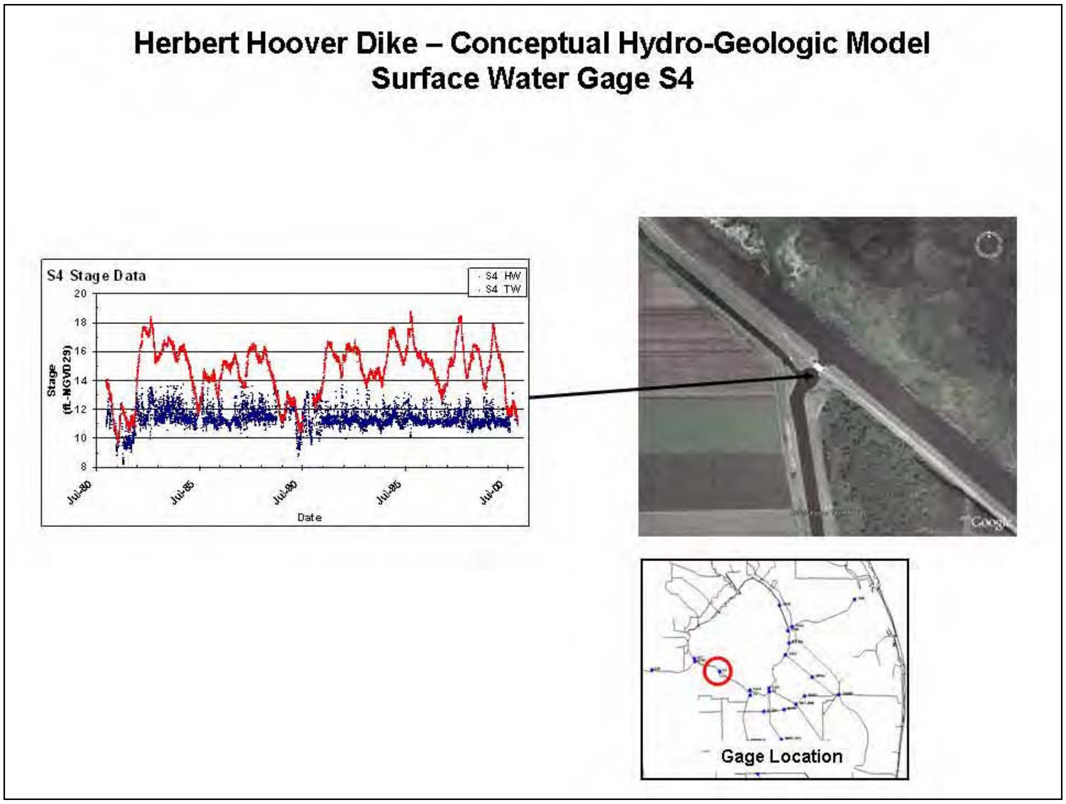


Figure E19. Historical data of canal water stage at Gage S4.

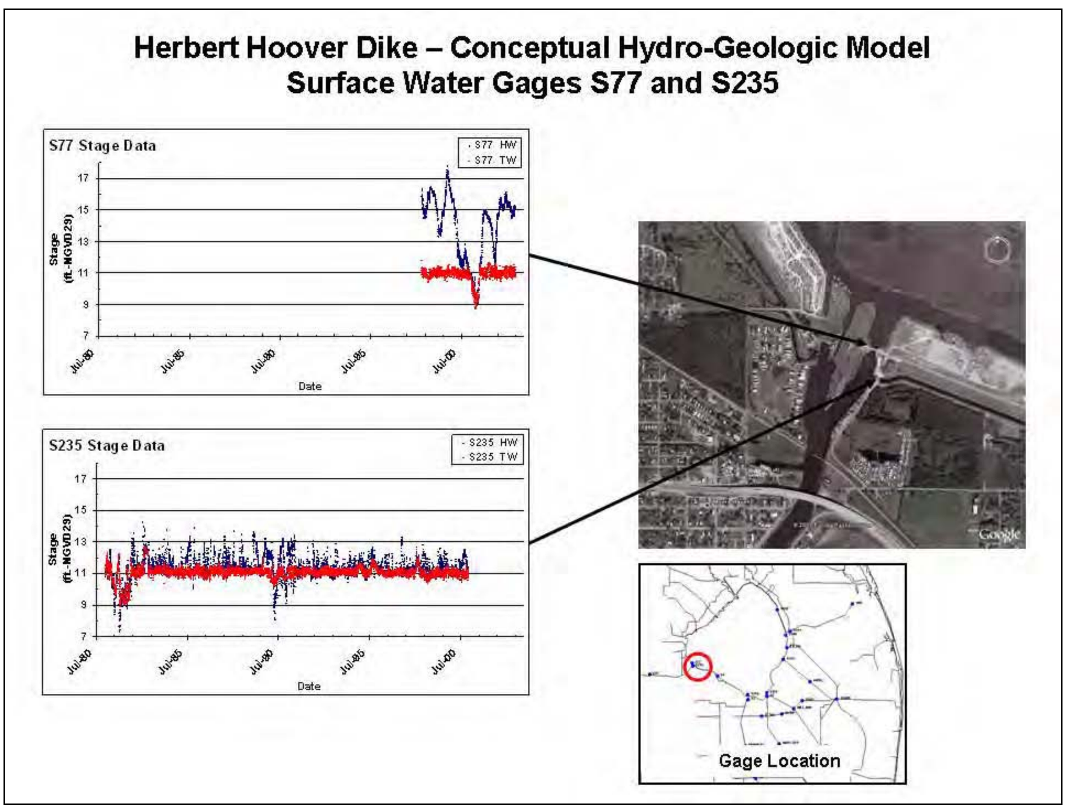


Figure E20. Historical data of canal water stage at Gages S77 and S235.

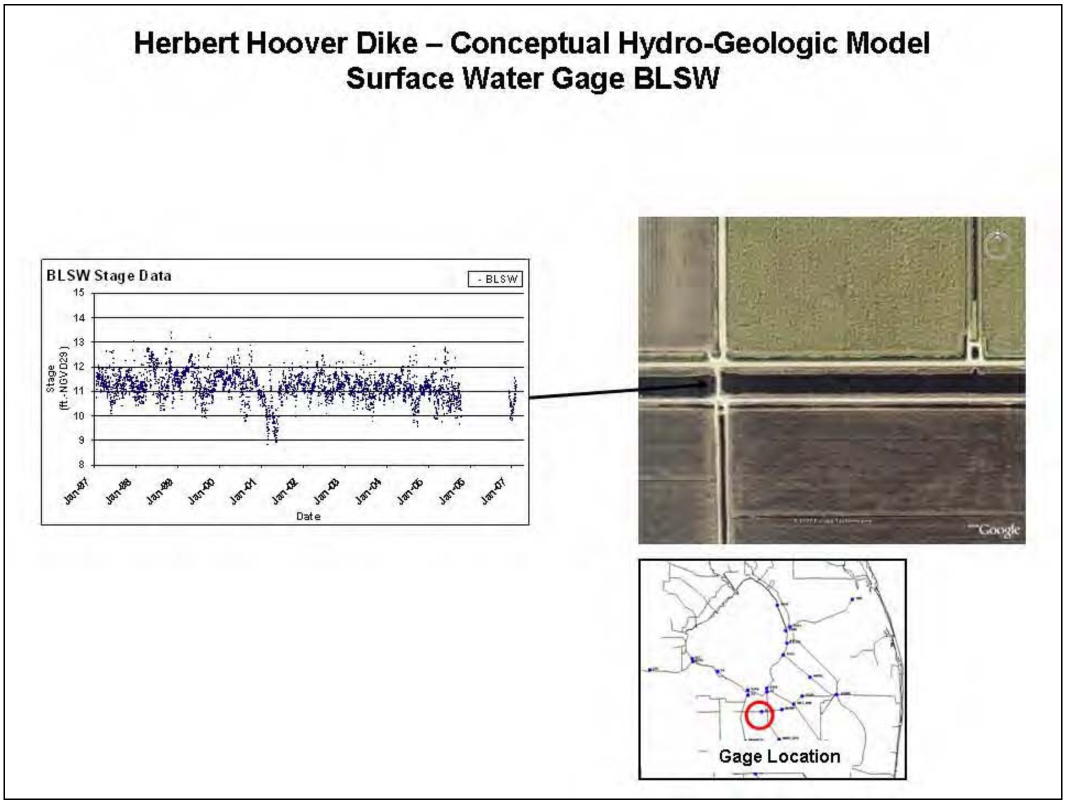


Figure E21. Historical data of canal water stage at Gage BLSW.

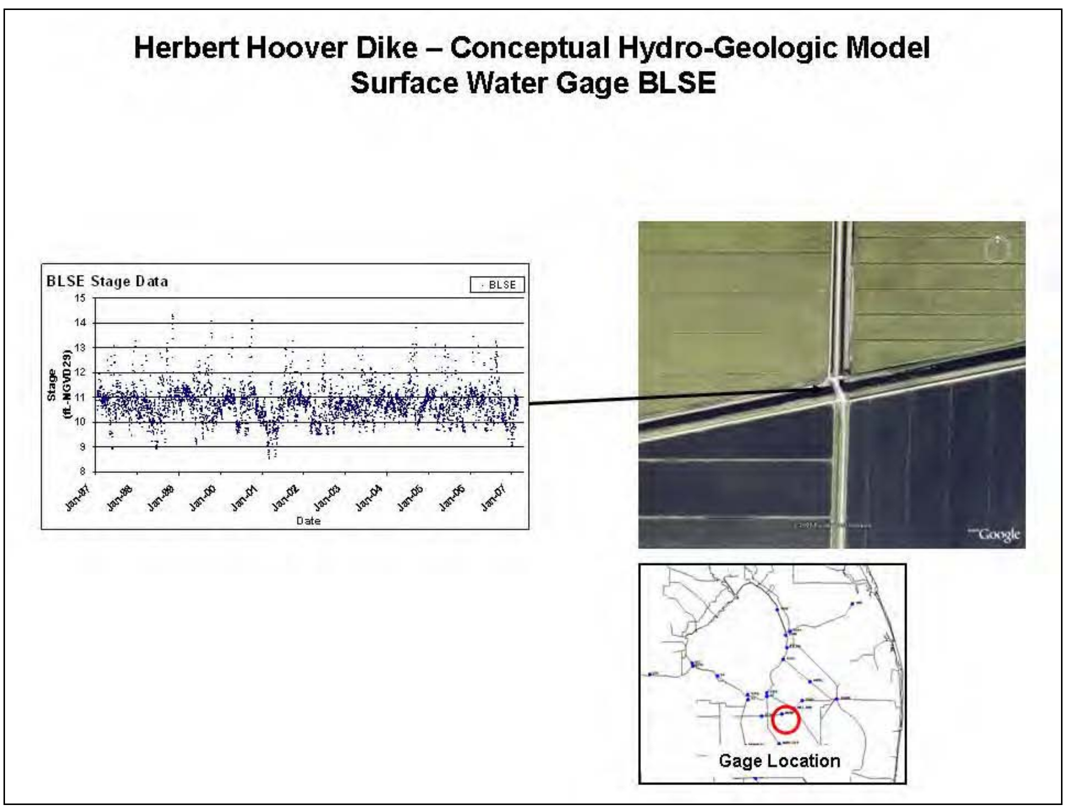


Figure E22. Historical data of canal water stage at Gage BLSE.

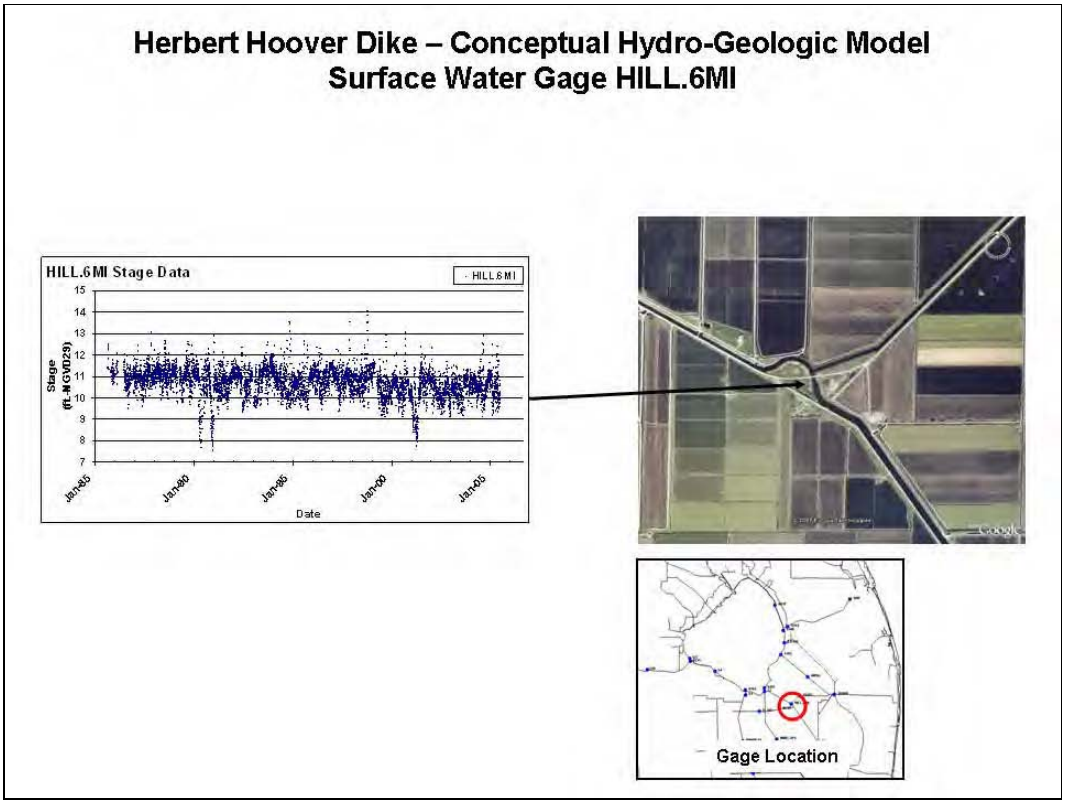


Figure E23. Historical data of canal water stage at Gage HILL.6MI.

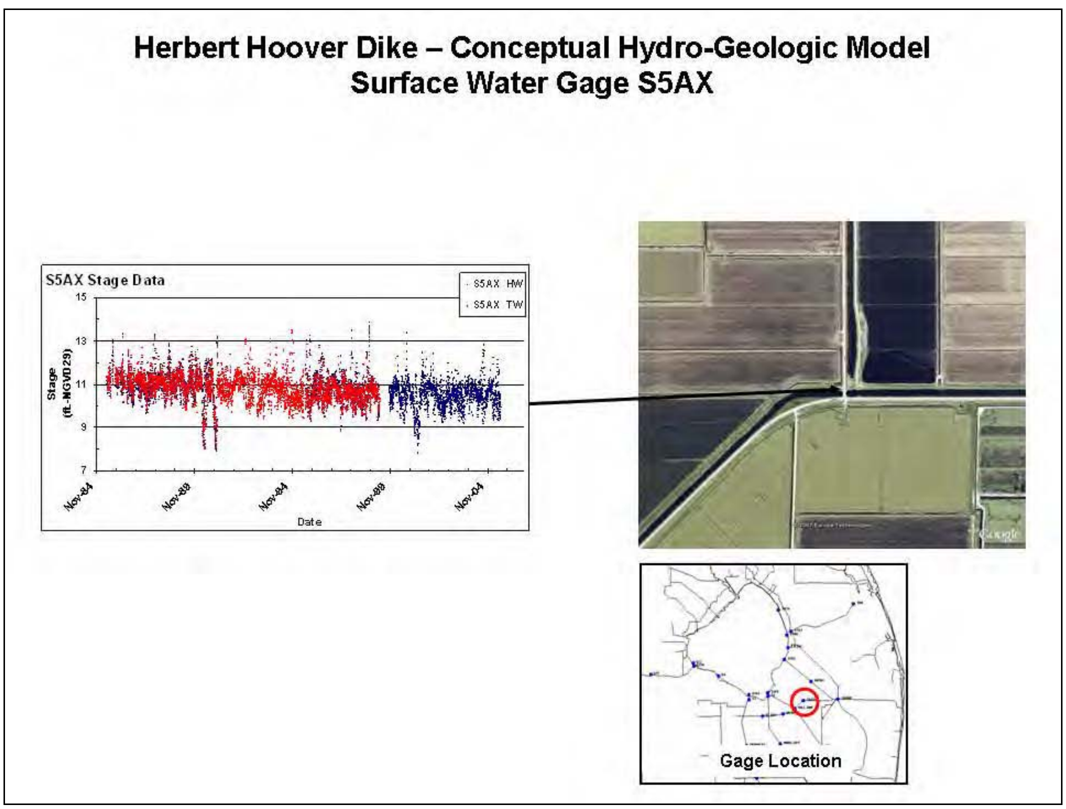


Figure E24. Historical data of canal water stage at Gage S5AX.

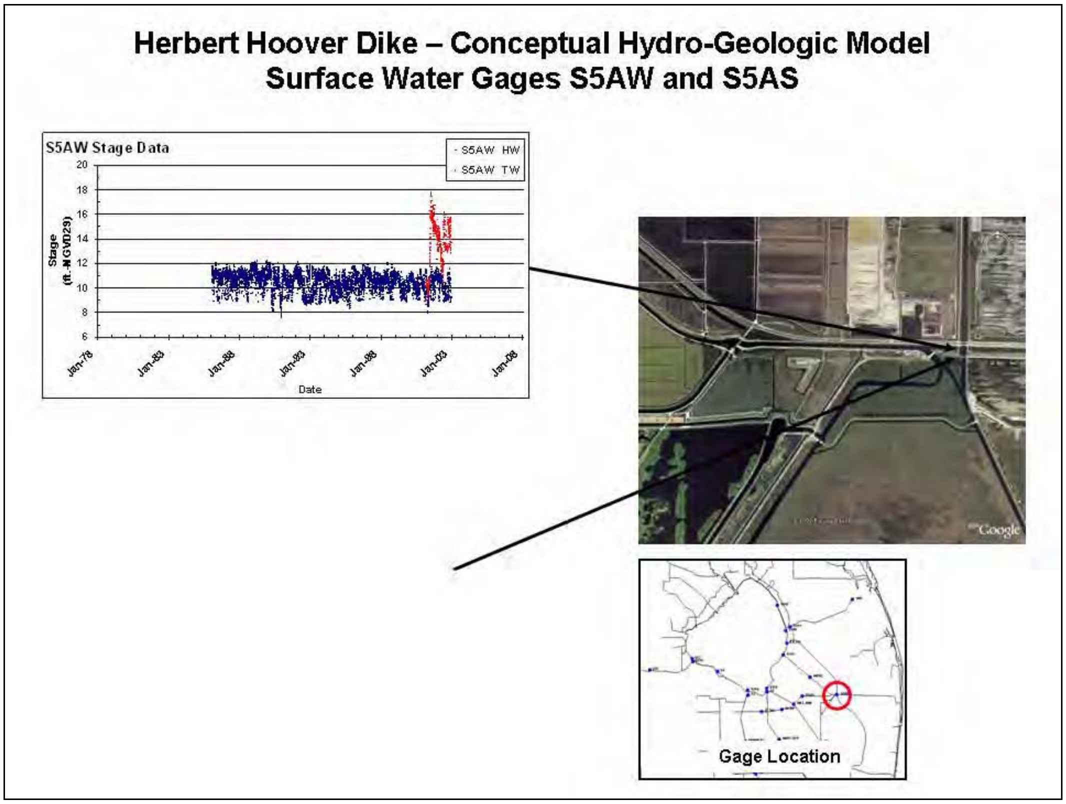


Figure E25. Historical data of canal water stage at Gage S5AW.

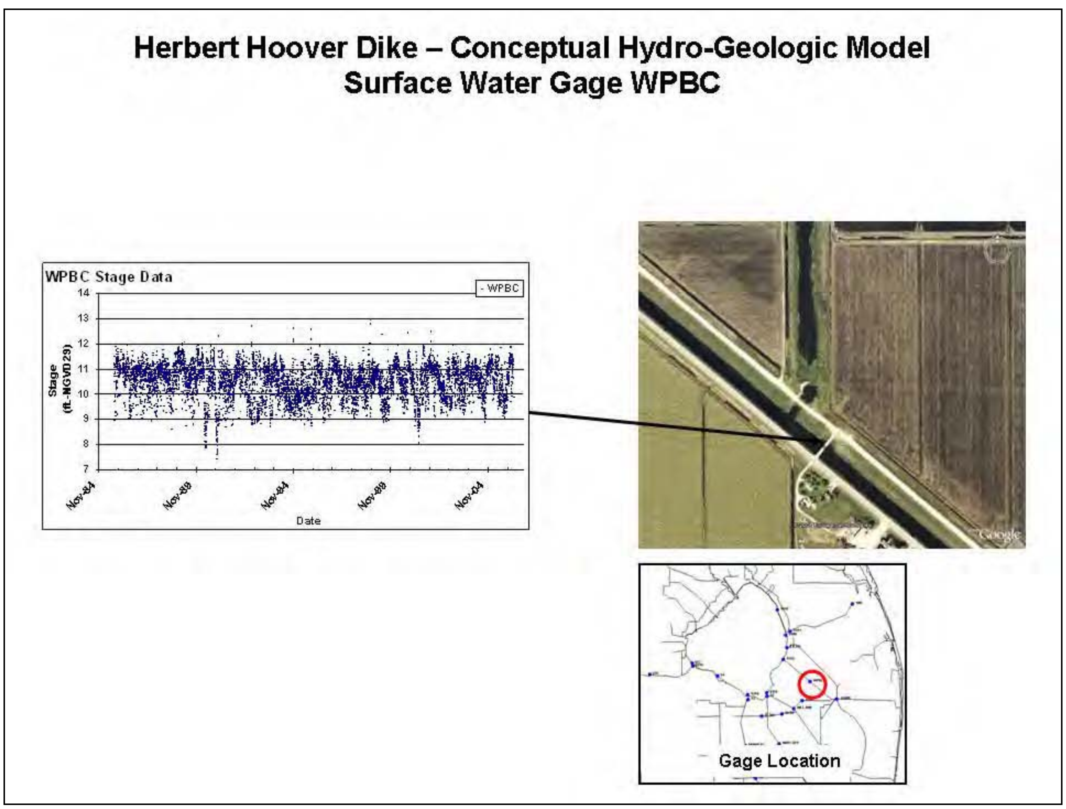


Figure E26. Historical data of canal water stage at Gage WPBC.

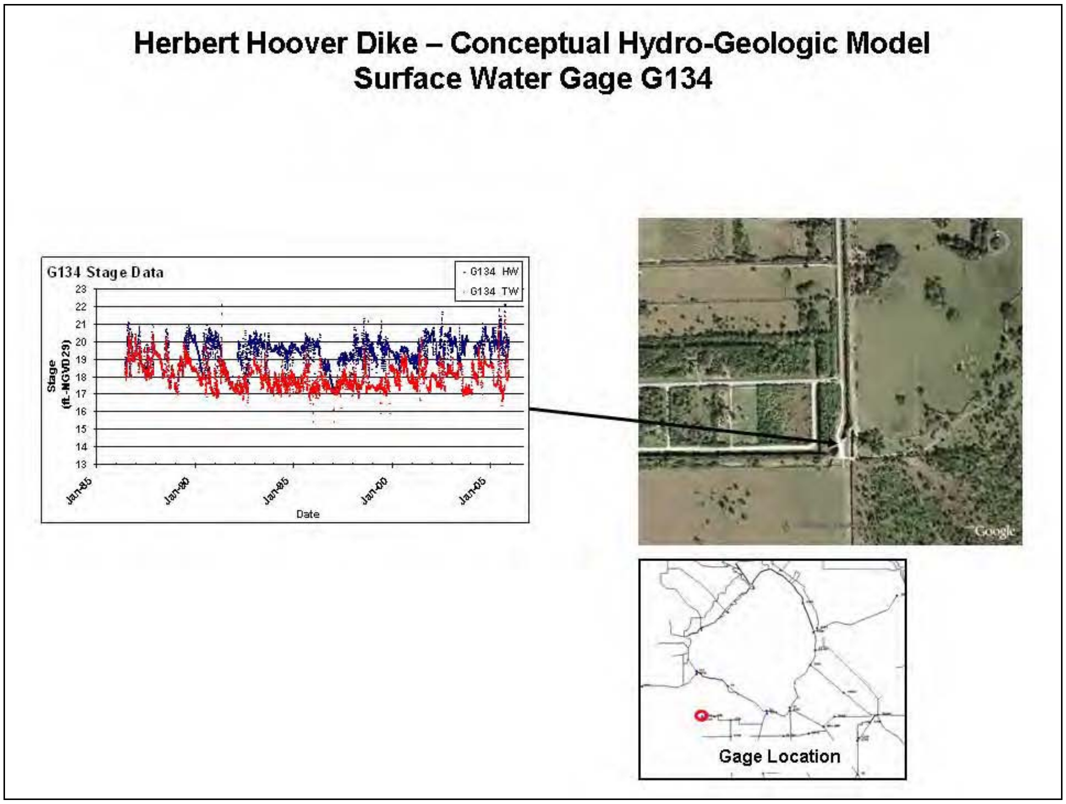


Figure E27. Historical data of canal water stage at Gage G134.

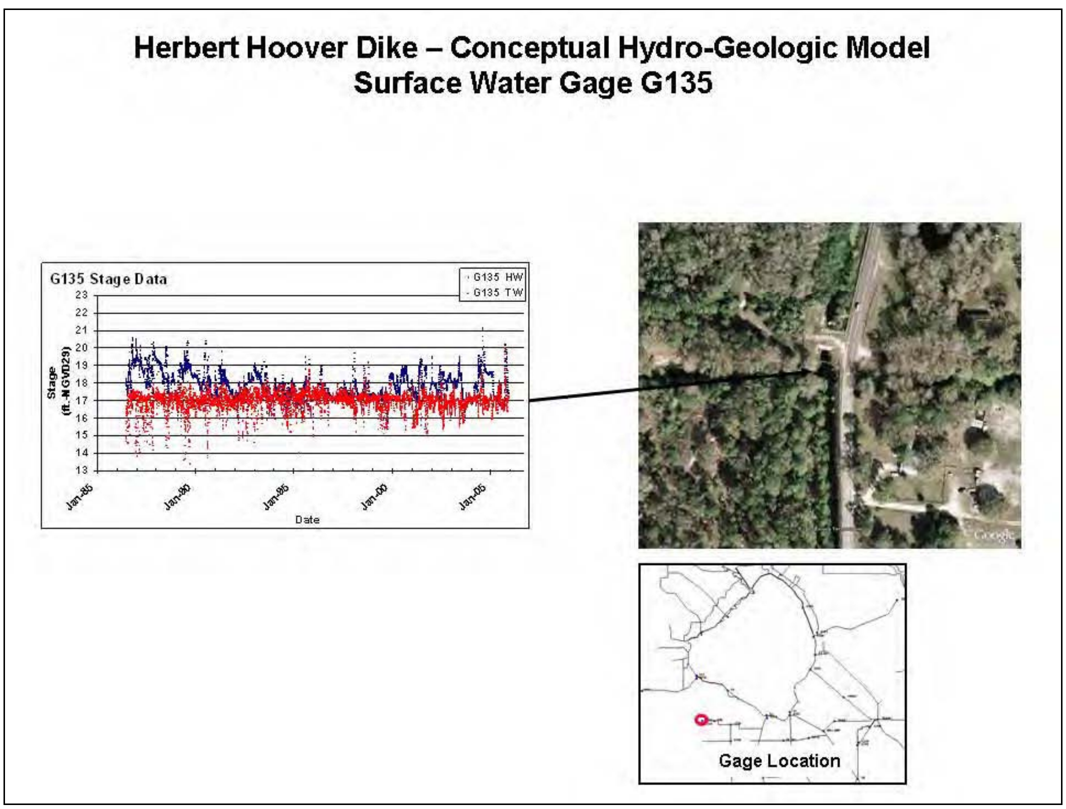


Figure E28. Historical data of canal water stage at Gage G135.

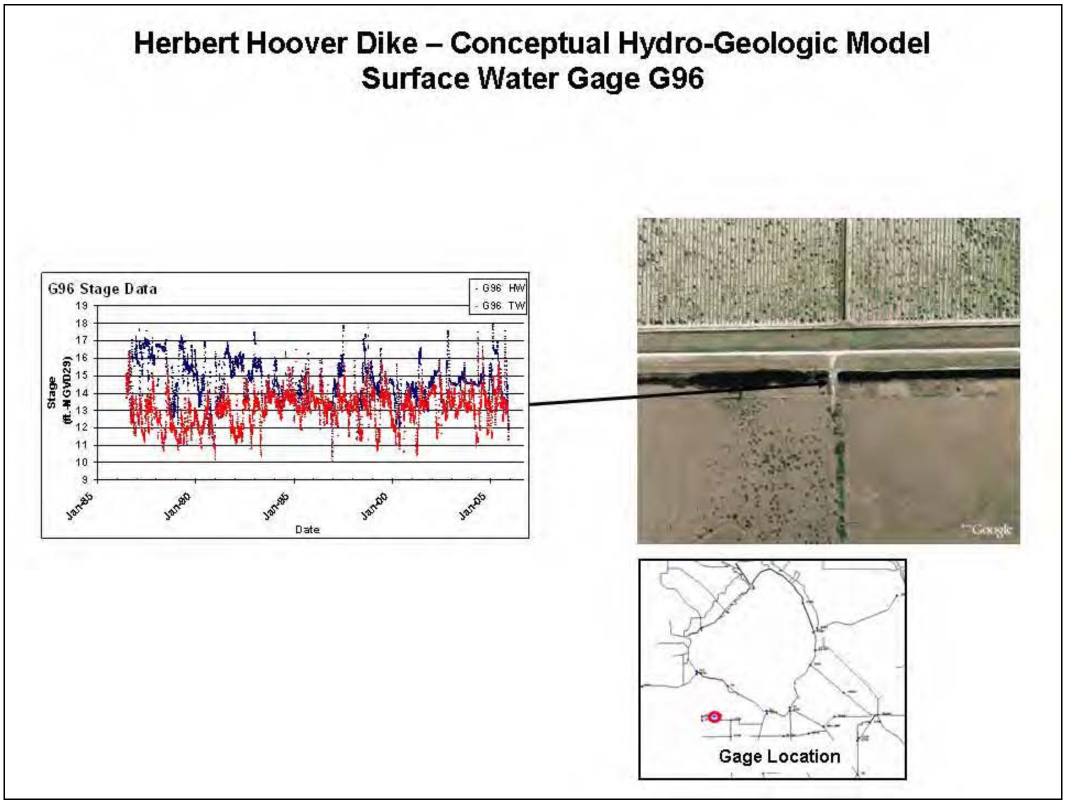


Figure E29. Historical data of canal water stage at Gage G96.

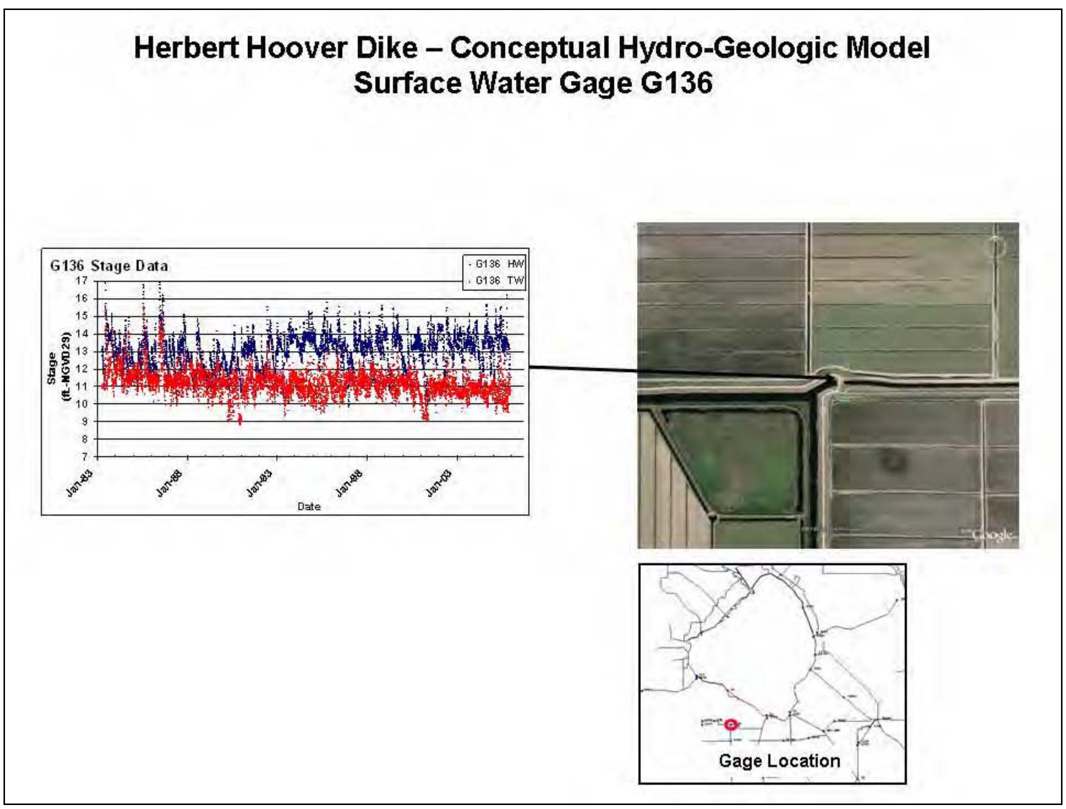


Figure E30. Historical data of canal water stage at Gage G136.

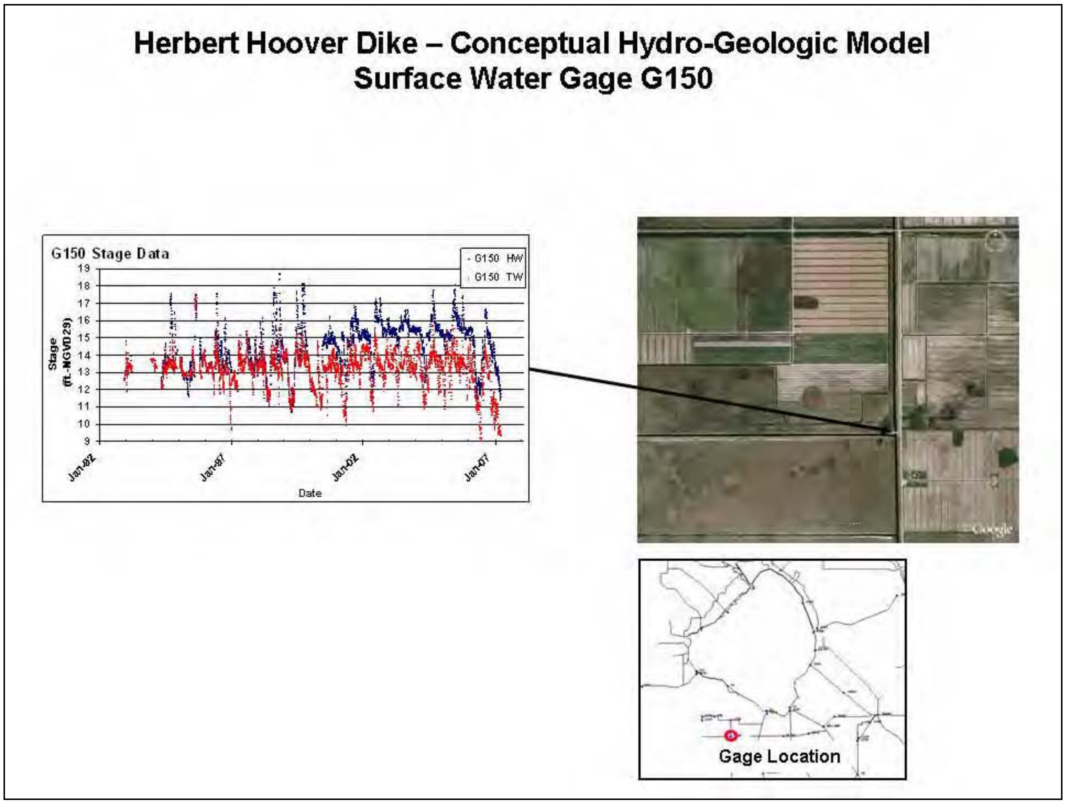


Figure E31. Historical data of canal water stage at Gage G150.

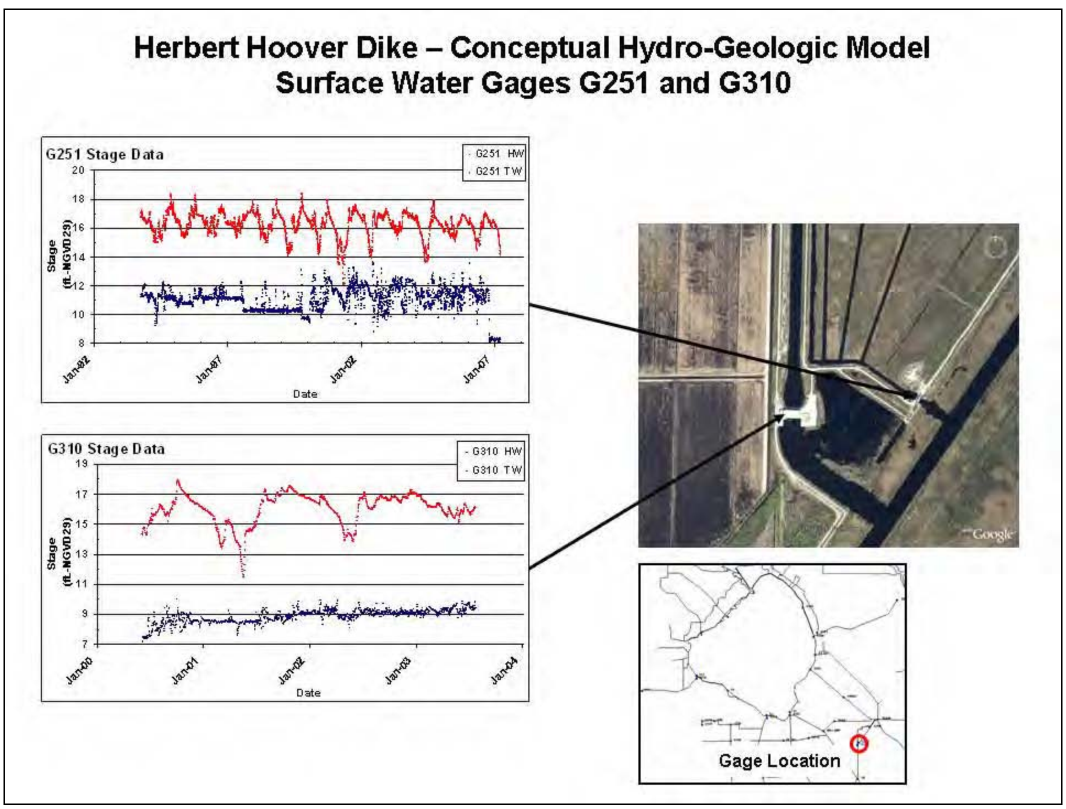


Figure E32. Historical data of canal water stage at Gages G251 and G310.

Appendix F. Figures of Stage 2 Results of HHD Phase 1A model.

There are 48 Figures (Figures F1 through F48) included in this appendix to show the Stage 2 results of HHD Phase 1A model. Each figure shows the pressure head comparison between a pair of "with project" and “without project” runs considered in Stage 2 analysis. The specification of each pair is defined in the title of each figure. The four brackets are color coded in theses figures as shown below:

0.1 $\leq$ Pressure Head Difference $\leq$ 0.5	Blue
0.5 $\leq$ Pressure Head Difference $\leq$ 1.0	Lime Green
1.0 $\leq$ Pressure Head Difference $\leq$ 2.0	Yellow
Pressure Head Difference $\geq$ 2.0	Red

A color coded scatter symbol is shown in plan-view where the difference occurs. Occasionally the number of points contained within a given bracket is very small or may be zero. For example, Figure F2 and Figure 4 do not have any occurrences where the absolute difference is $\geq$ 2.0 feet, hence there are no red symbols. Figure 9 had only 19 occurrences (0.003%) where the absolute difference is $\geq$ 2.0 feet. In such cases, this “red” bracket is isolated for readability and shown in the upper left corner of the related figure. Often these isolated cases of high differences are at or in close proximity to pumps.

There are also 6 Tables (Tables F1 through F6) included in this appendix to show a head difference comparison among the eight combinations of the K values of Materials L2-1, L3A, and L3B-2 when both the net recharge and head boundary condition and the pumping condition are fixed. For a full description of the simulation details for each run, refer to the areas shaded in yellow in the tables. The absolute values of the differences of pressure head were categorized into 4 brackets; number of occurrences were counted and then converted to represent the percentage of total computational points in the domain. For example, “Run49 - Run1” is a difference of with project minus without project wall, testing the set where

there was a high net recharge, high head boundary condition, high pumping, and high hydraulic conductivity for all layers: L2, L3A, and L3B2. For this example, there were 122832 nodal locations, or 18.3% (= (122832/671100)x100%), with the pressure head absolute difference fell within a bracket of 0.1 and 0.5feet.

The maximum mean absolute difference (MA Diff, defined in Equation F1) among all 48 pairs of comparisons is 0.3068 feet, and occurs in the case of "Run53 – Run5". The maximum root mean square difference (RMS Diff, defined in Equation F2) is 0.6107 feet, and also occurs during the comparison of Run 53 and Run 5. Runs 53 and 5 were simulations with high net recharge and head boundary conditions, high pumping capacity, high hydraulic conductivity values for Materials L2-1 and L3A, and low hydraulic conductivity value for Material L3B-2. The maximum absolute difference (Max Diff, defined in Equation F3) is 118.28 feet and occurs during the comparison of Run 72 and Run 24. Runs 72 and 24 were simulations with medium net recharge and head boundary conditions, high pumping capacity, and low hydraulic conductivity for Materials L2-1, L3A, and L3B-2. The (x,y,z) location of the maximum absolute difference occurs at state coordinate (686030.0, 870110.4, -46.0), which is within 100-feet from the "Ridgdill and Son" pump well (indicated with the red circle in Figure 24). This well had a maximum pumping capacity of 866,310 cfd and was simulated with a screen length between -4 and 14-ft NAVD88. As we can see from Figure F24 as well as from other figures, when high pumping was applied, the maximum head difference due to high pumping is a localized phenomenon. The high pumping rate generates an unsaturated zone within the associated cone of depression. And the size of this unsaturated zone grows bigger from the "without project" scenario to the associated "with project" scenario. This growth may cause a large head change at a computational mesh node when it goes from saturated (in the "without project" scenario) to unsaturated (in the "with project" scenario). This is exactly how the 118.28-foot head difference is caused in the comparison of Run 72 and Run 24. On the other hand, when the growth of unsaturated zone does not cause more computational mesh nodes included in the unsaturated zone, the head difference caused by the cutoff wall is not that significant.

The mean absolute difference (MA Diff), the root mean square difference (RMS Diff), and the maximum absolute difference (Max Diff) are defined as follows.

$$MA\ Diff = \frac{\sum_{i=1}^{n} \left| H_i^{with-wall} - H_i^{no-wall} \right|}{n} \tag{F1}$$

$$RMS\ Diff = \sqrt{\frac{\sum_{i=1}^{n} \left| H_i^{with-wall} - H_i^{no-wall} \right|^2}{n}} \tag{F2}$$

$$Max\ Diff = Maximum\left(\left| H_i^{with-wall} - H_i^{no-wall} \right| \right) \tag{F3}$$

where *n* is the number of comparisons between the computed head with the cutoff wall in it place and the corresponding computed head without the cutoff wall considered (n = number of mesh nodes here); $H_i^{with-wall}$ is the computed head at the i-th mesh node with the cutoff wall in its place [L]; $H_i^{no-wall}$ is the computed head at the i-th mesh node without the cutoff wall considered [L].

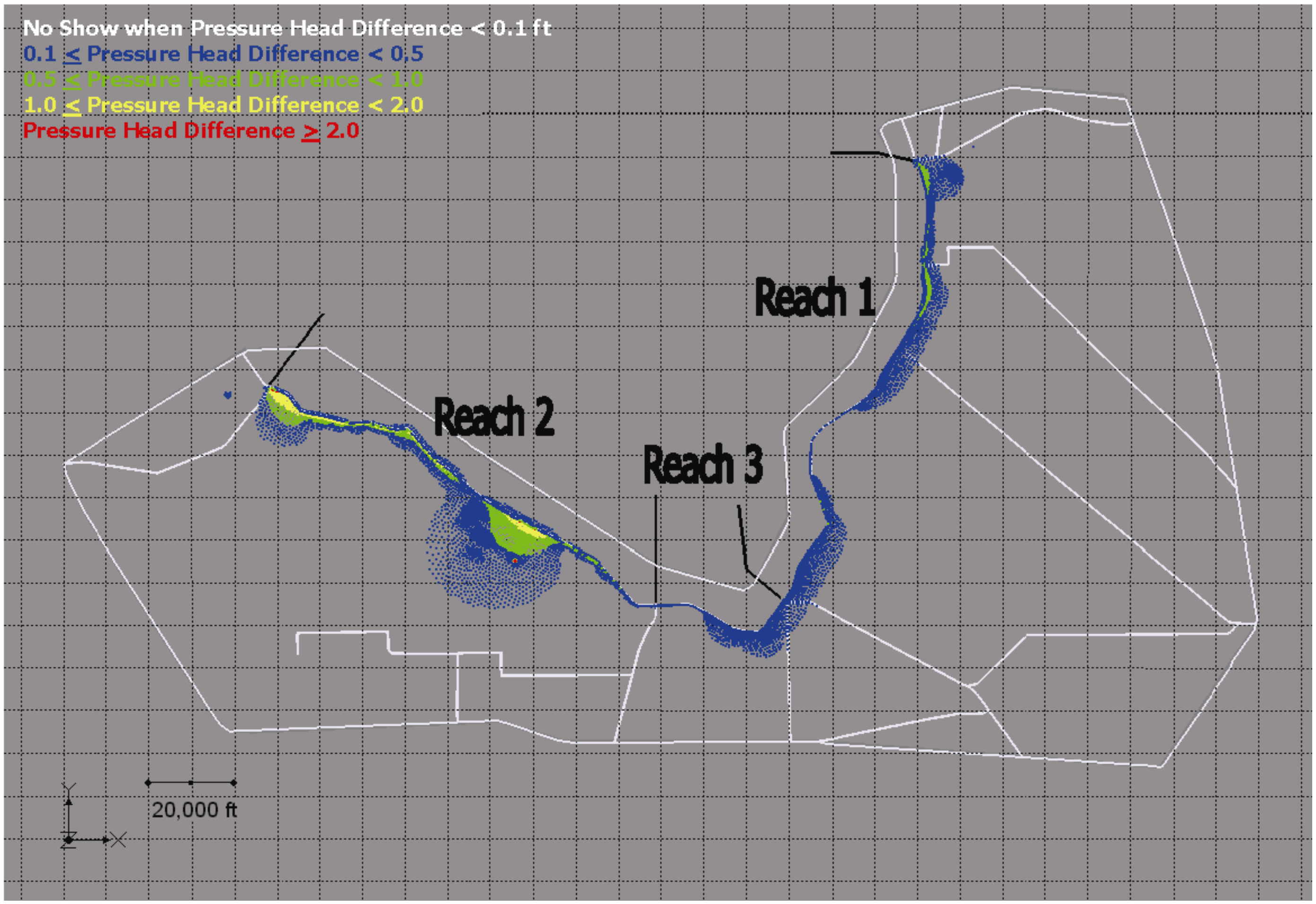


Figure F1. Pressure head comparison between "with project" and “with project” runs in Stage 2 analysis: high net recharge and head boundary conditions, high pumping, high L2-1 K, high L3A K, and high L3B-2 K. (Set A: Run49 - Run1).

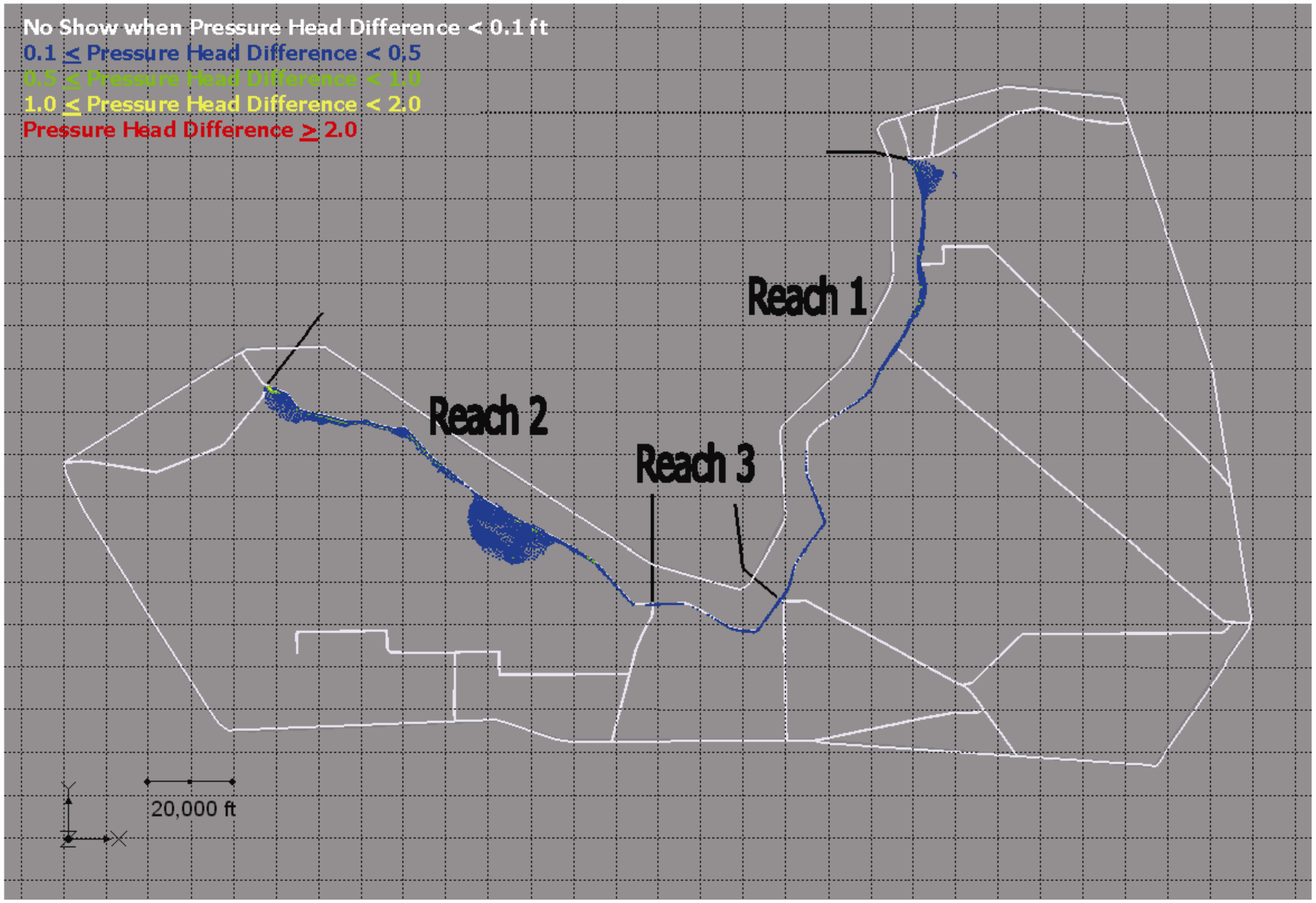


Figure F2. Pressure head comparison between "with project" and “with project” runs in Stage 2 analysis: high net recharge and head boundary conditions, high pumping, high L2-1 K, low L3A K, and high L3B-2 K. (Set A: Run50 - Run2).

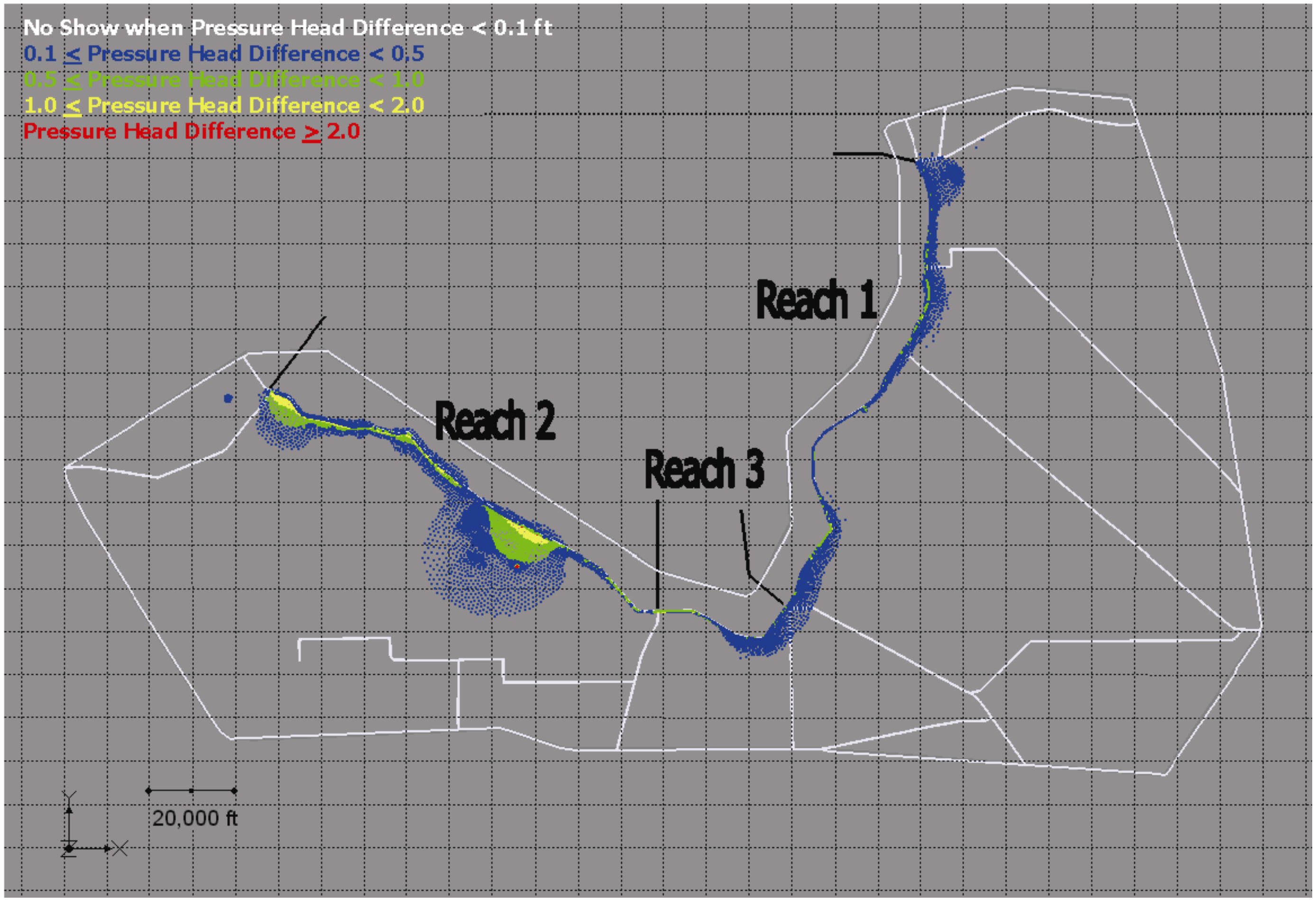


Figure F3. Pressure head comparison between "with project" and “with project” runs in Stage 2 analysis: high net recharge and head boundary conditions, high pumping, low L2-1 K, high L3A K, and high L3B-2 K. (Set A: Run51 - Run3).

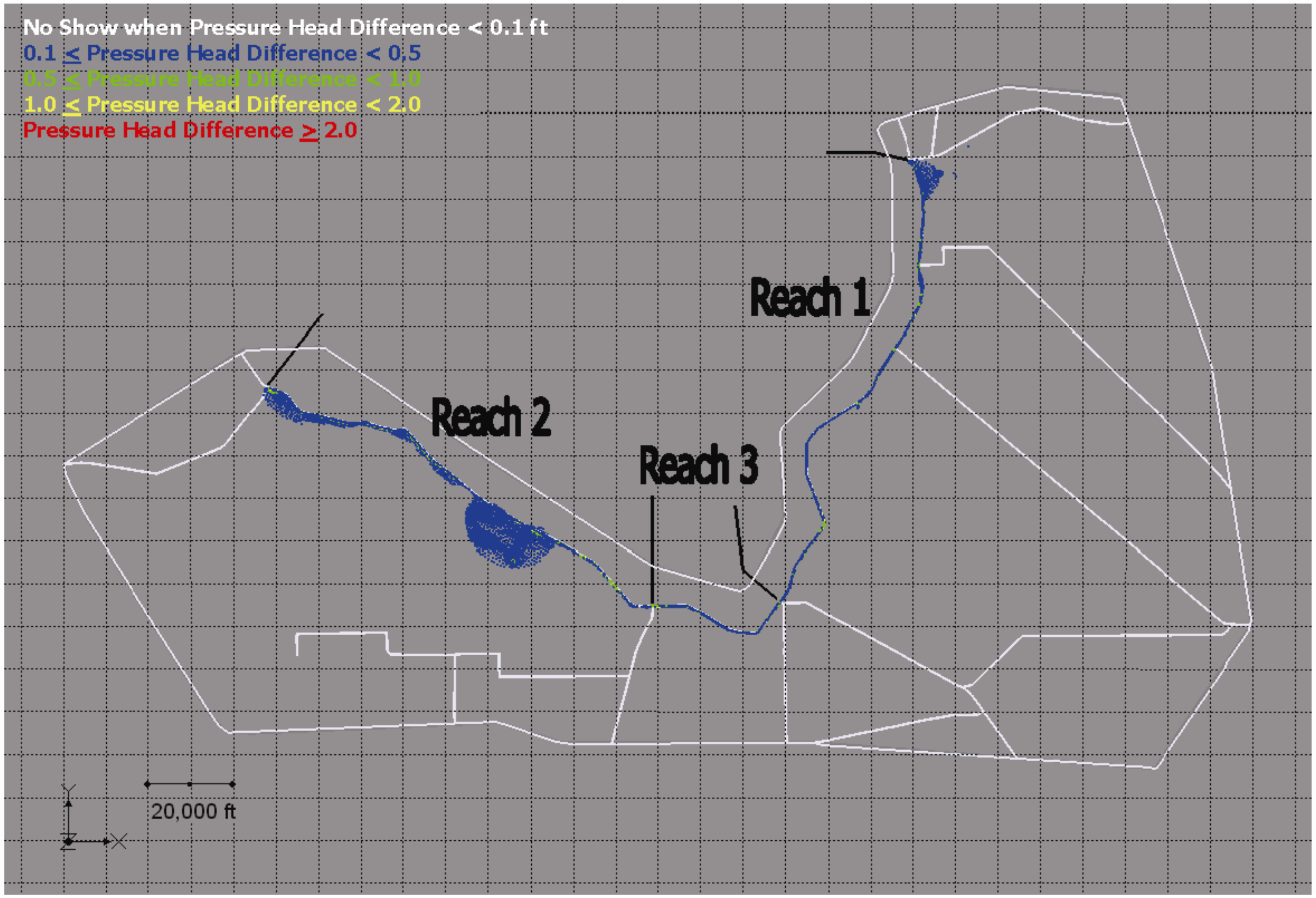


Figure F4. Pressure head comparison between "with project" and “with project” runs in Stage 2 analysis: high net recharge and head boundary conditions, high pumping, low L2-1 K, low L3A K, and high L3B-2 K. (Set A: Run52 - Run4).

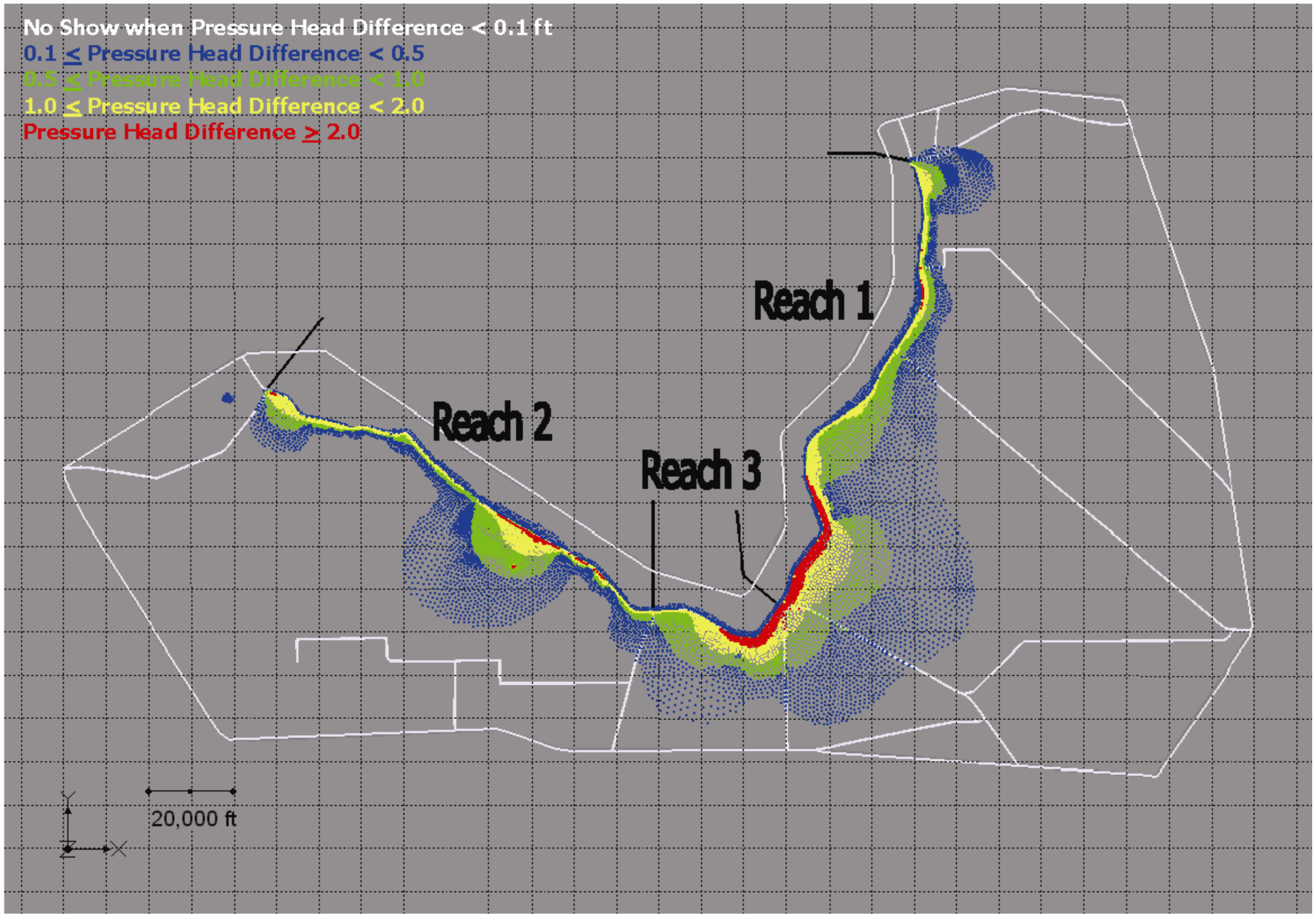


Figure F5. Pressure head comparison between "with project" and “with project” runs in Stage 2 analysis: high net recharge and head boundary conditions, high pumping, high L2-1 K, high L3A K, and low L3B-2 K. (Set A: Run53 - Run5).

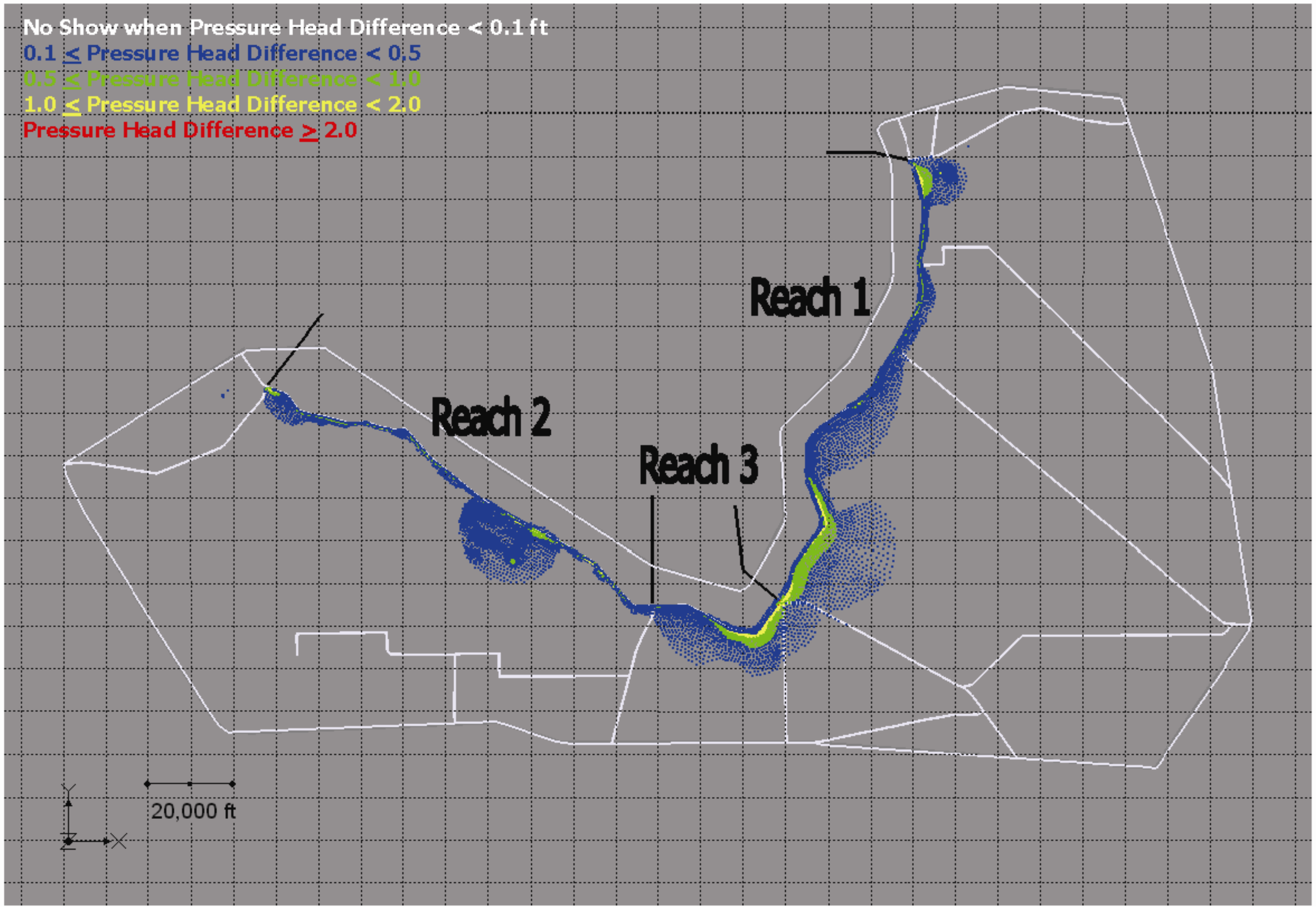


Figure F6. Pressure head comparison between "with project" and “with project” runs in Stage 2 analysis: high net recharge and head boundary conditions, high pumping, high L2-1 K, low L3A K, and low L3B-2 K. (Set A: Run54 - Run6).

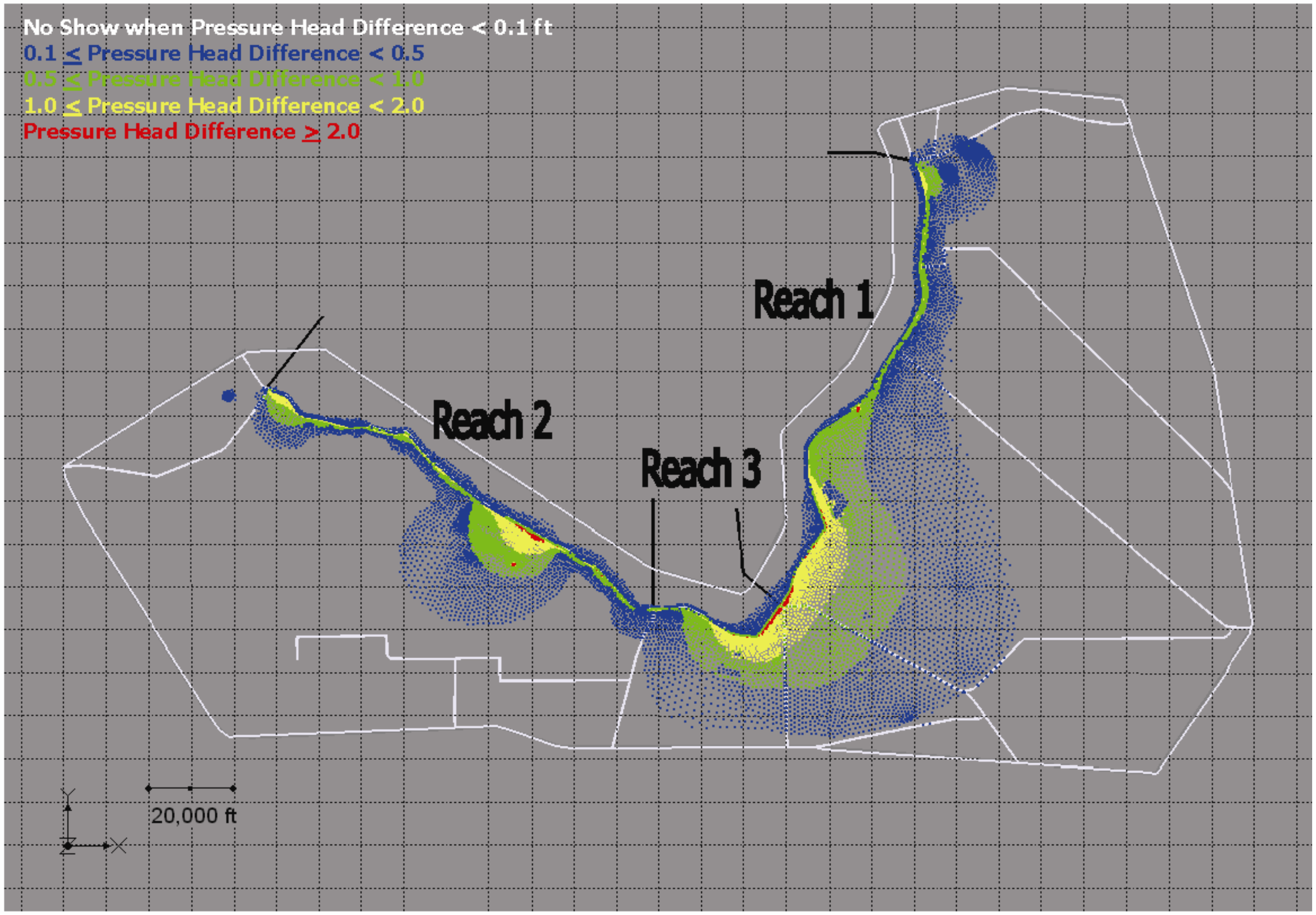


Figure F7. Pressure head comparison between "with project" and “with project” runs in Stage 2 analysis: high net recharge and head boundary conditions, high pumping, low L2-1 K, high L3A K, and low L3B-2 K. (Set A: Run55 - Run7).

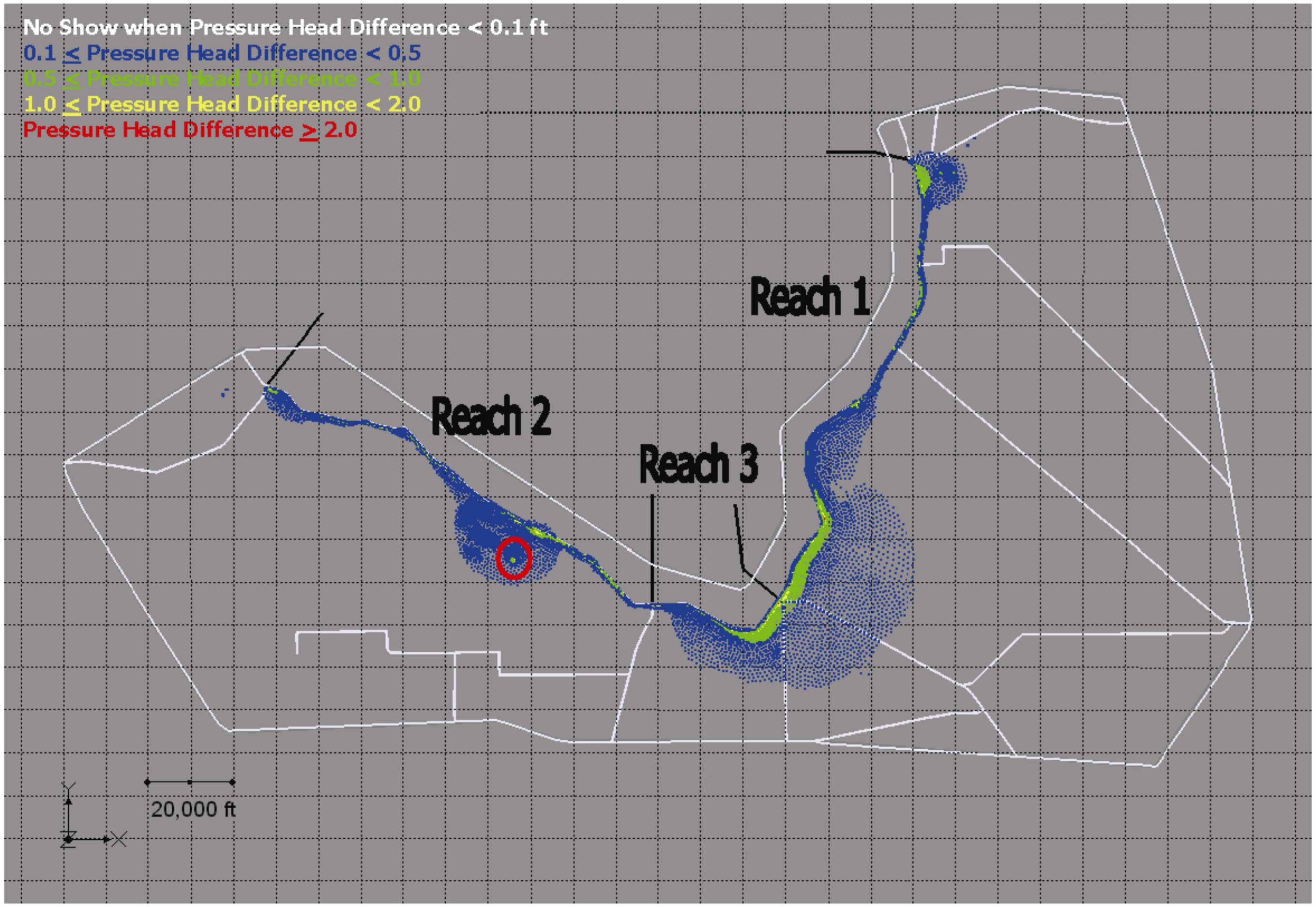


Figure F8. Pressure head comparison between "with project" and “with project” runs in Stage 2 analysis: high net recharge and head boundary conditions, high pumping, low L2-1 K, low L3A K, and low L3B-2 K. (Set A: Run56 - Run8).

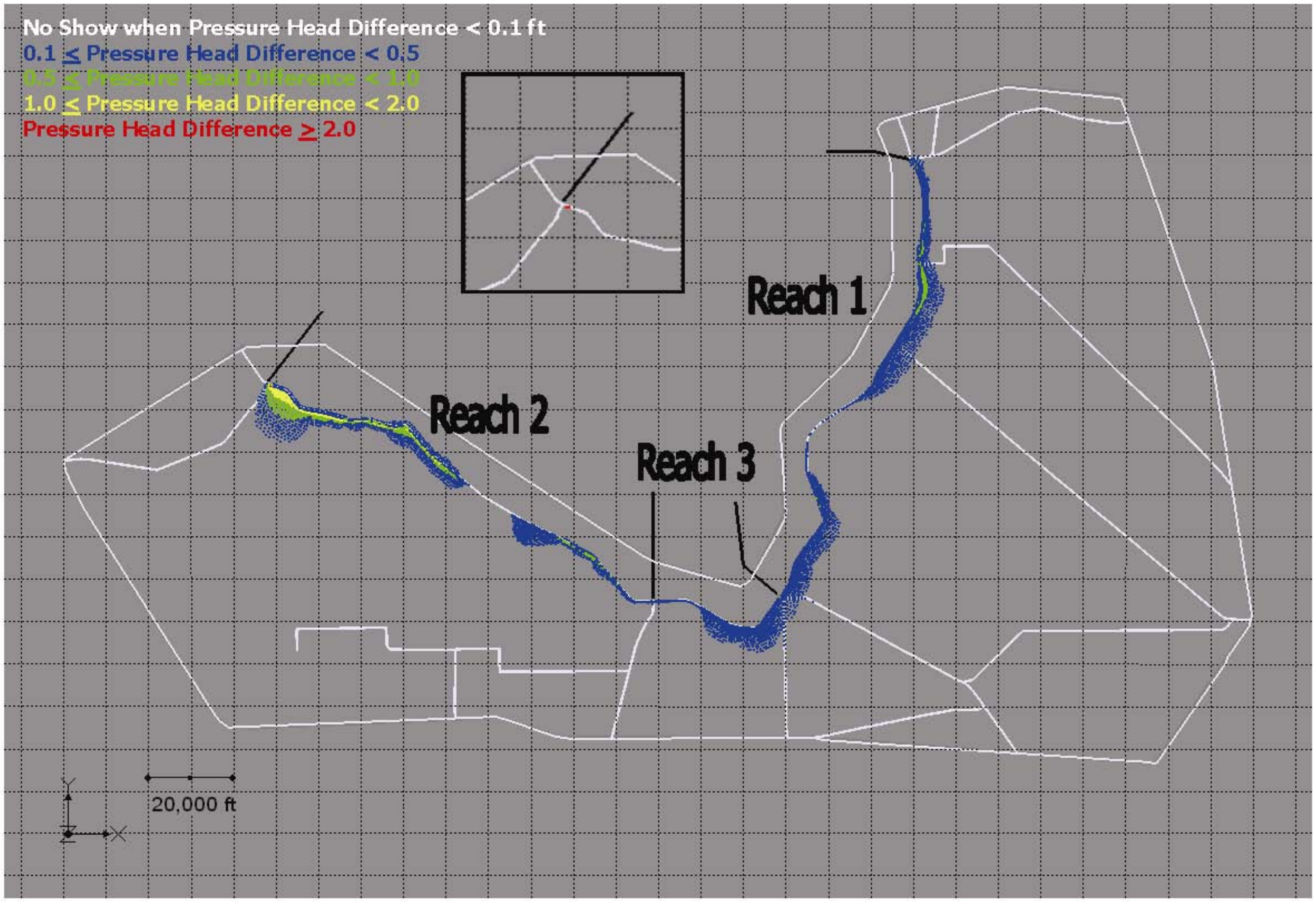


Figure F9. Pressure head comparison between "with project" and “with project” runs in Stage 2 analysis: high net recharge and head boundary conditions, low pumping, high L2-1 K, high L3A K, and high L3B-2 K. (Set B: Run57 - Run9).

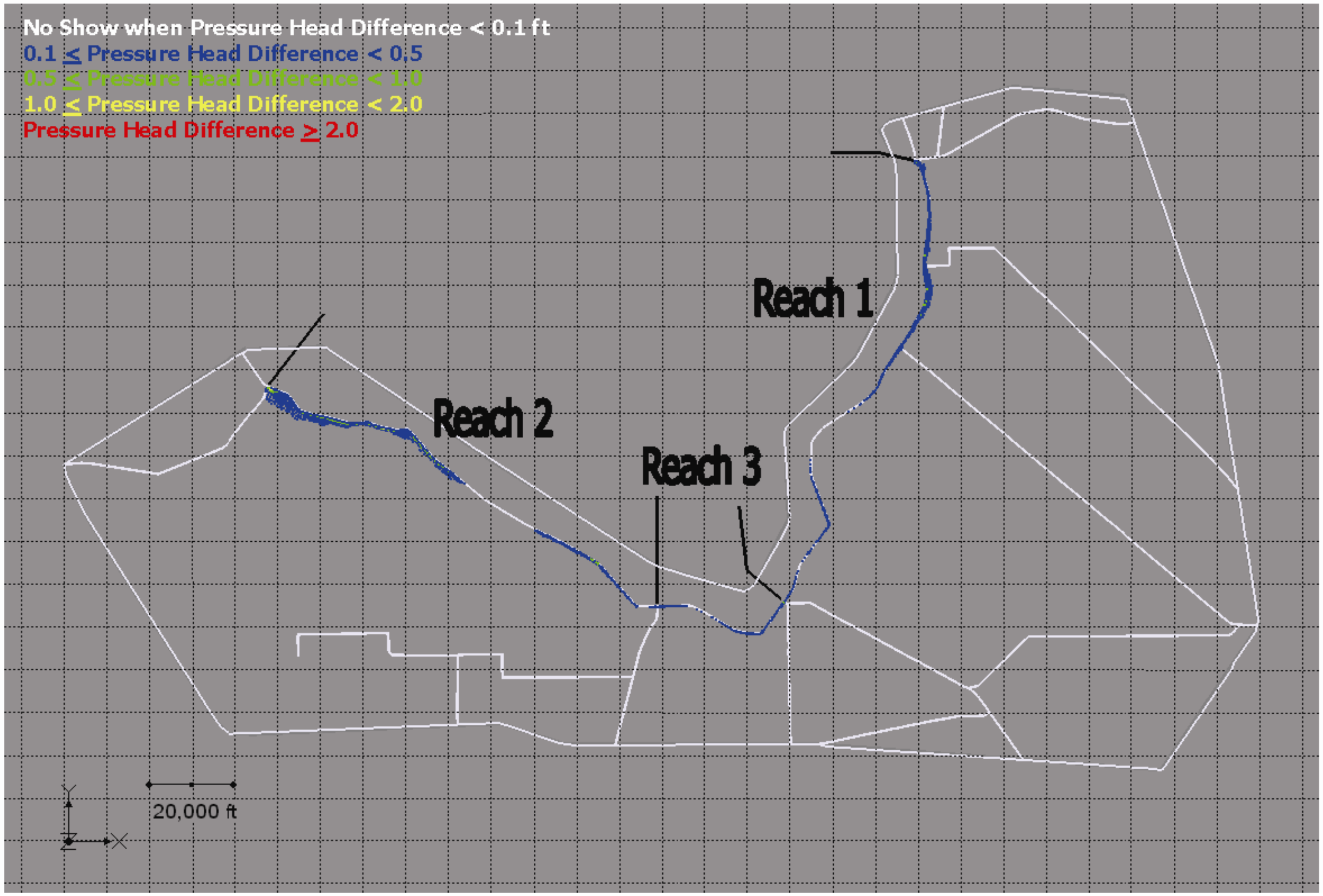


Figure F10. Pressure head comparison between "with project" and “with project” runs in Stage 2 analysis: high net recharge and head boundary conditions, low pumping, high L2-1 K, low L3A K, and high L3B-2 K. (Set B: Run58 - Run10).

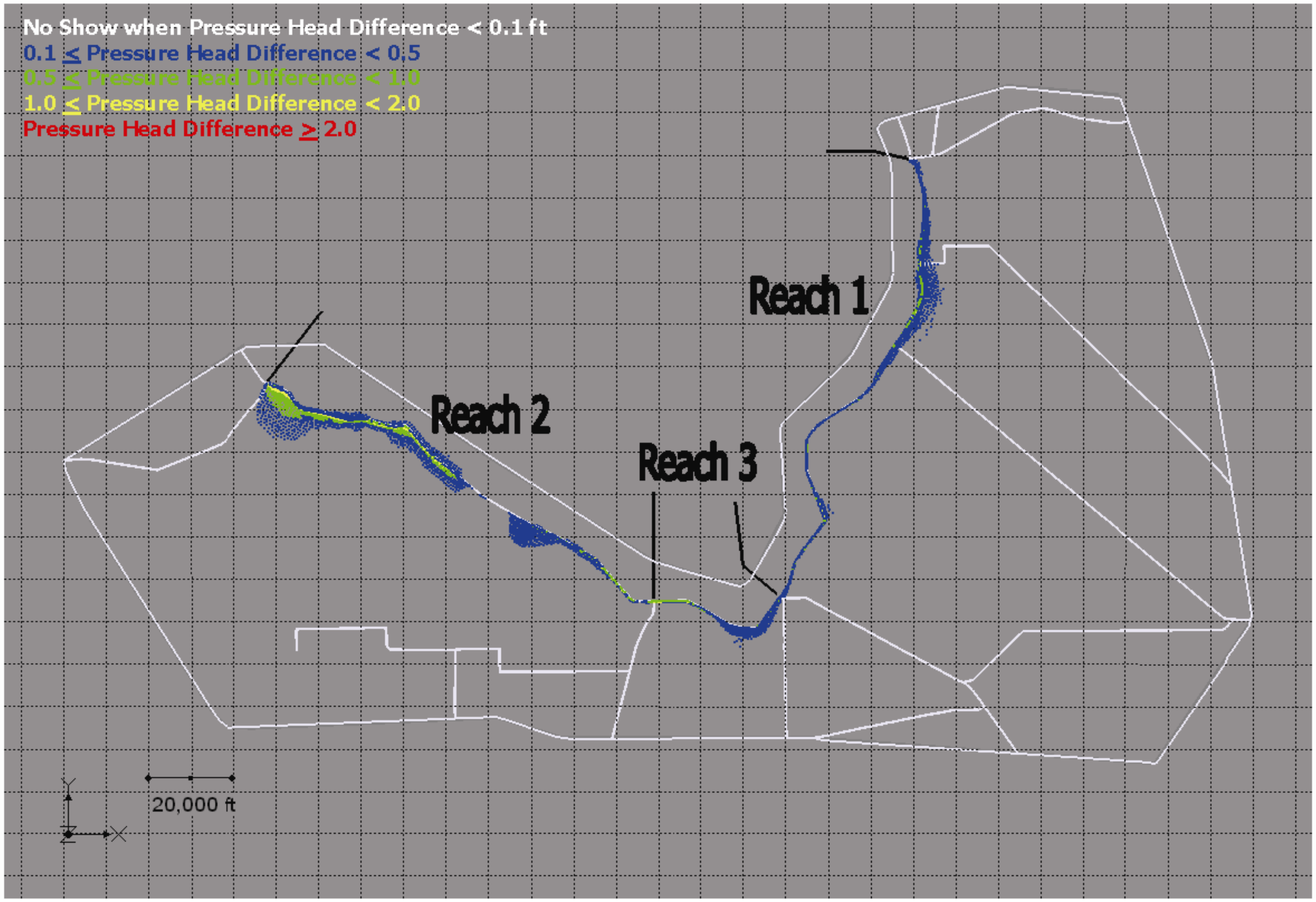


Figure F11. Pressure head comparison between "with project" and “with project” runs in Stage 2 analysis: high net recharge and head boundary conditions, low pumping, low L2-1 K, high L3A K, and high L3B-2 K. (Set B: Run59 - Run11).

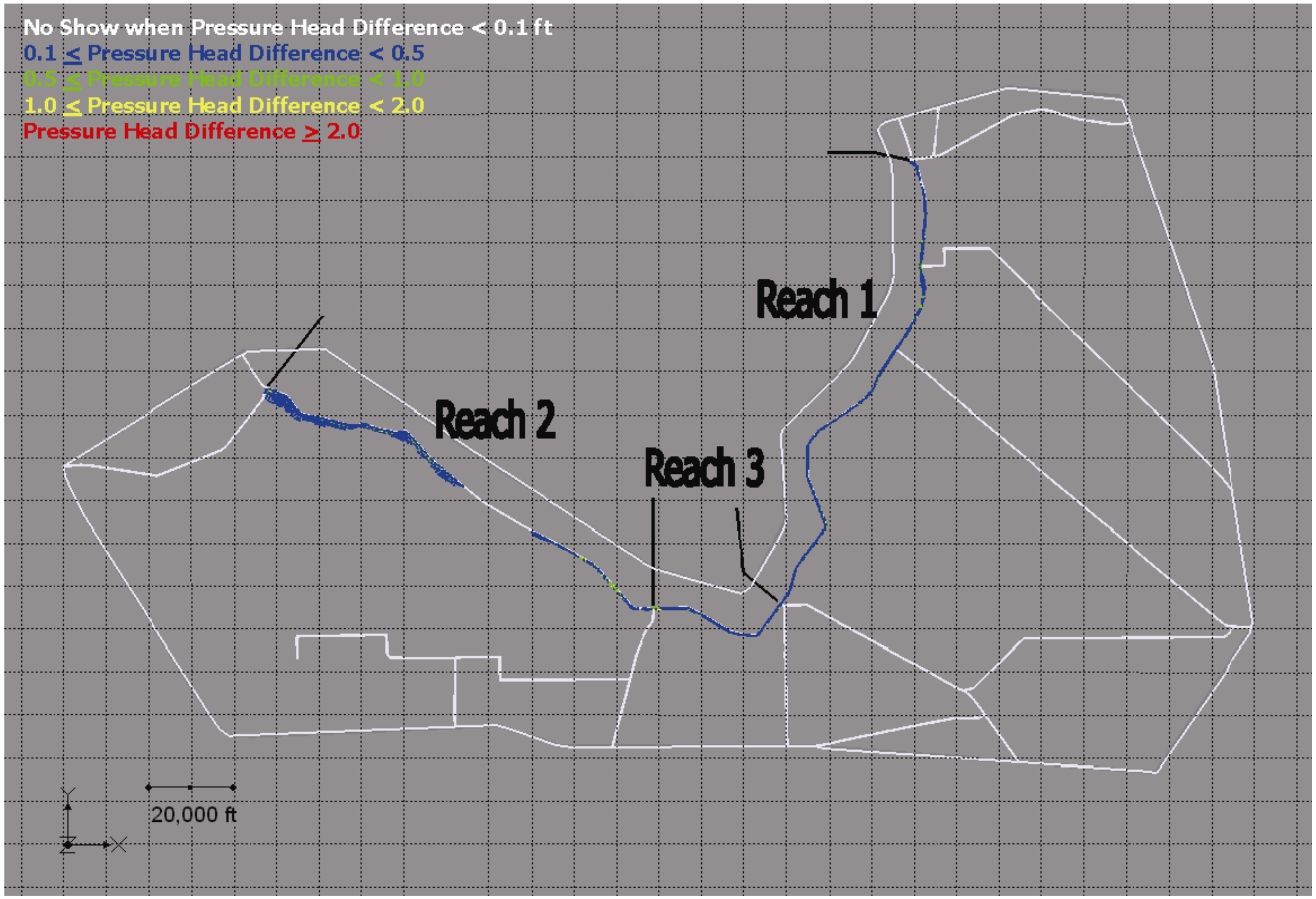


Figure F12. Pressure head comparison between "with project" and “with project” runs in Stage 2 analysis: high net recharge and head boundary conditions, low pumping, low L2-1 K, low L3A K, and high L3B-2 K. (Set B: Run60 - Run12).

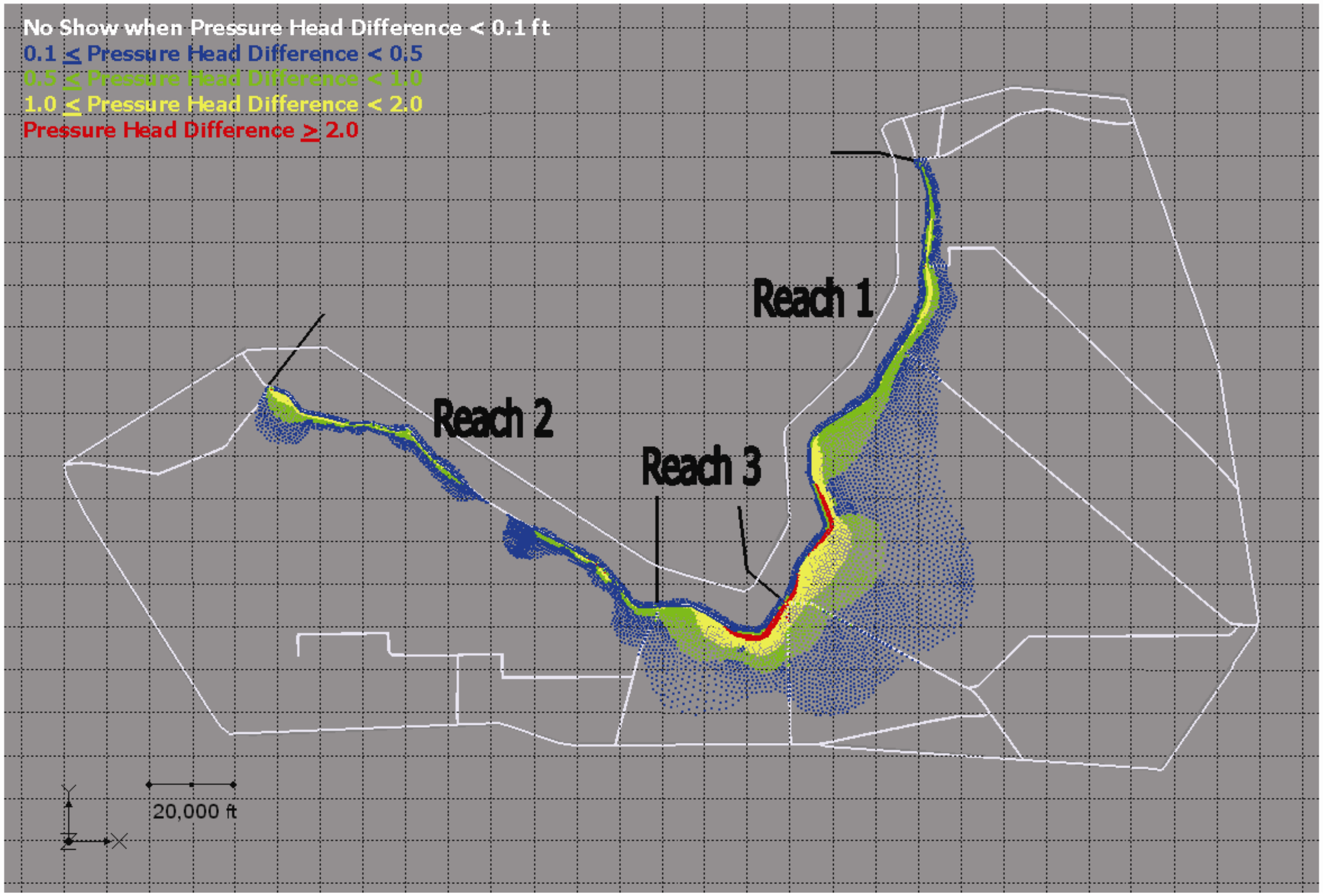


Figure F13. Pressure head comparison between "with project" and “with project” runs in Stage 2 analysis: high net recharge and head boundary conditions, low pumping, high L2-1 K, high L3A K, and low L3B-2 K. (Set B: Run61 - Run13).

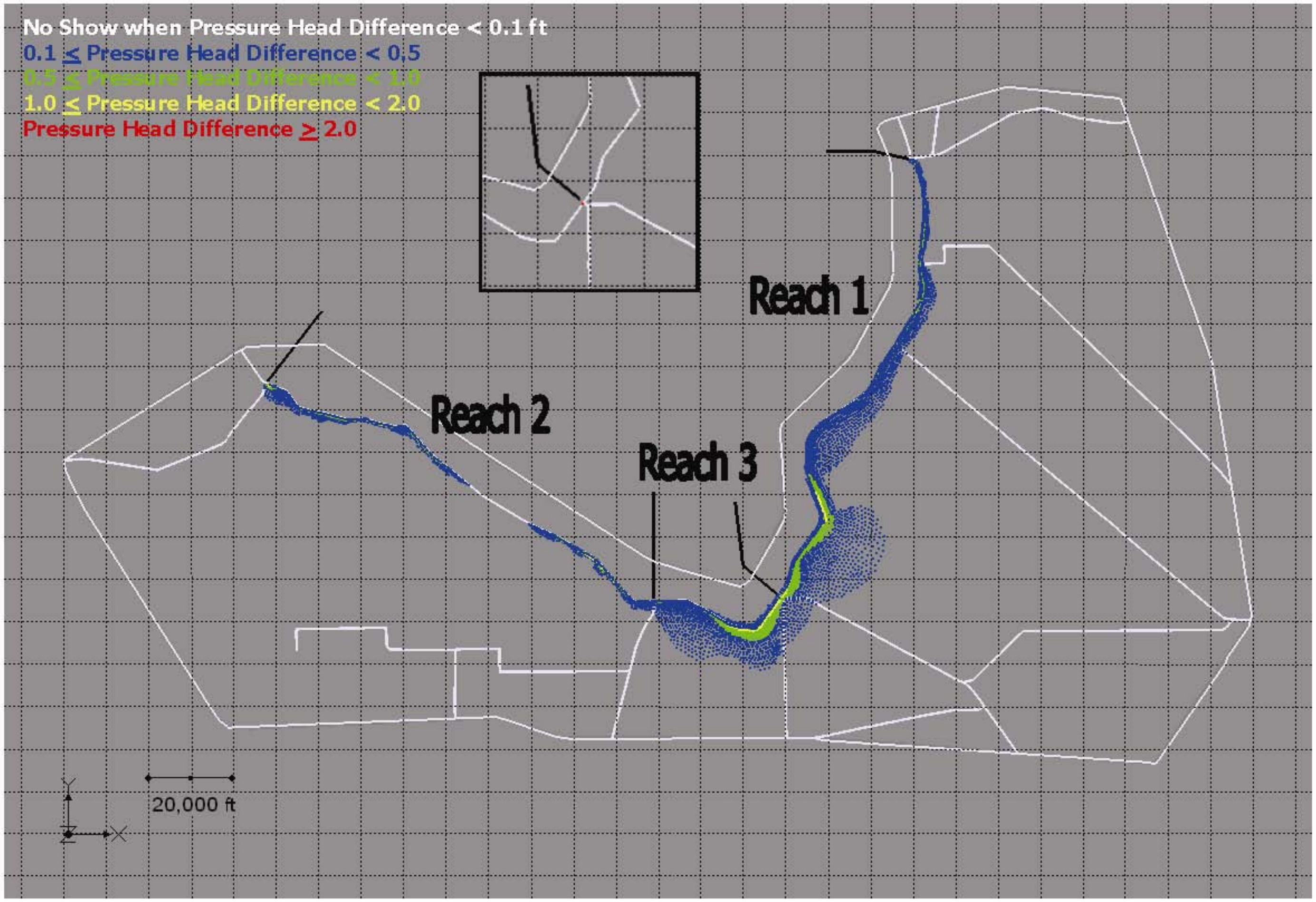


Figure F14. Pressure head comparison between "with project" and “with project” runs in Stage 2 analysis: high net recharge and head boundary conditions, low pumping, high L2-1 K, low L3A K, and low L3B-2 K. (Set B: Run62 - Run14).

Figure F15. Pressure head comparison between "with project" and “with project” runs in Stage 2 analysis: high net recharge and head boundary conditions, low pumping, low L2-1 K, high L3A K, and low L3B-2 K. (Set B: Run63 - Run15).

Figure F16. Pressure head comparison between "with project" and “with project” runs in Stage 2 analysis: high net recharge and head boundary conditions, low pumping, low L2-1 K, low L3A K, and low L3B-2 K. (Set B: Run64 - Run16).

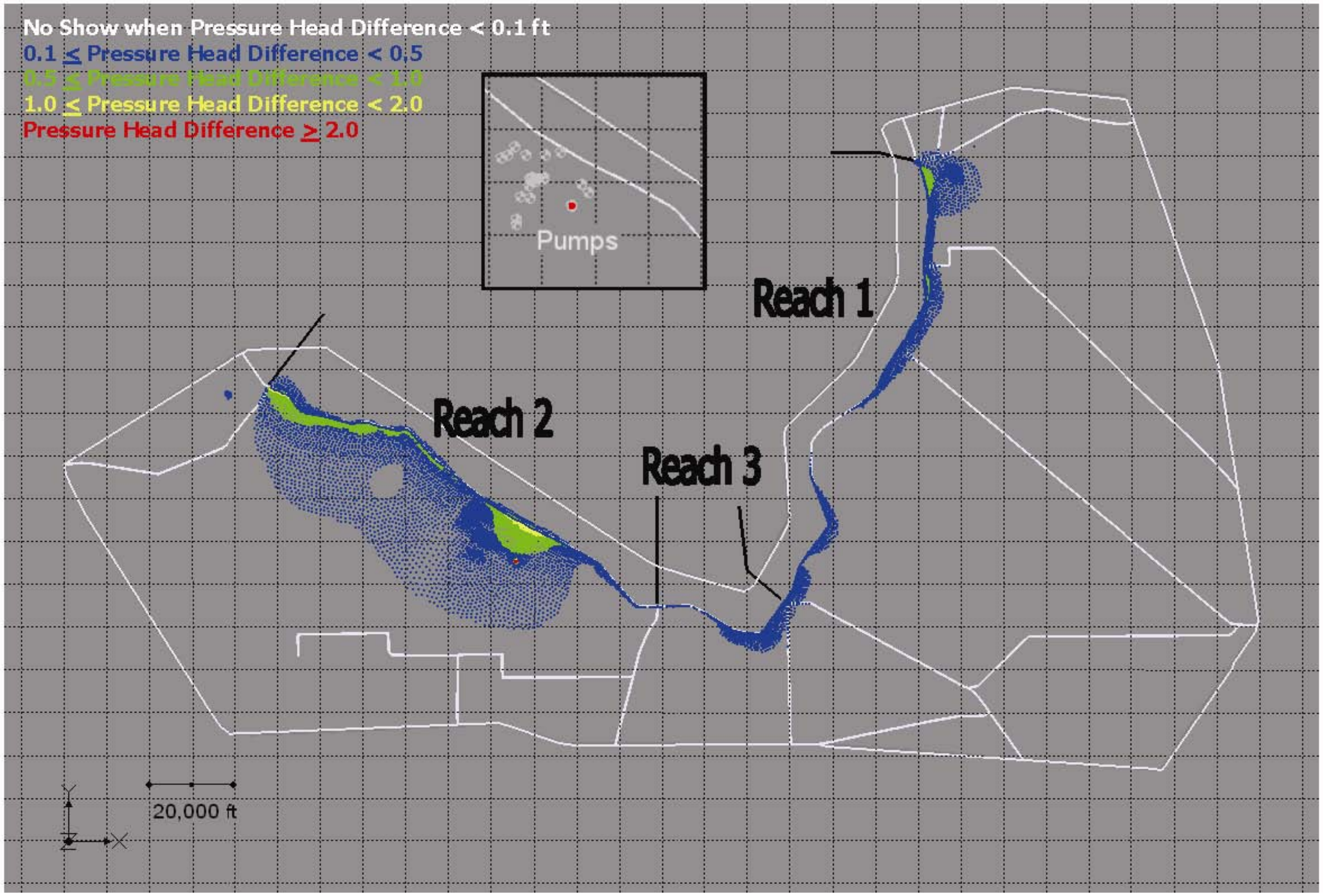


Figure F17. Pressure head comparison between "with project" and “with project” runs in Stage 2 analysis: medium net recharge and head boundary conditions, high pumping, high L2-1 K, high L3A K, and high L3B-2 K. (Set C: Run65 - Run17).

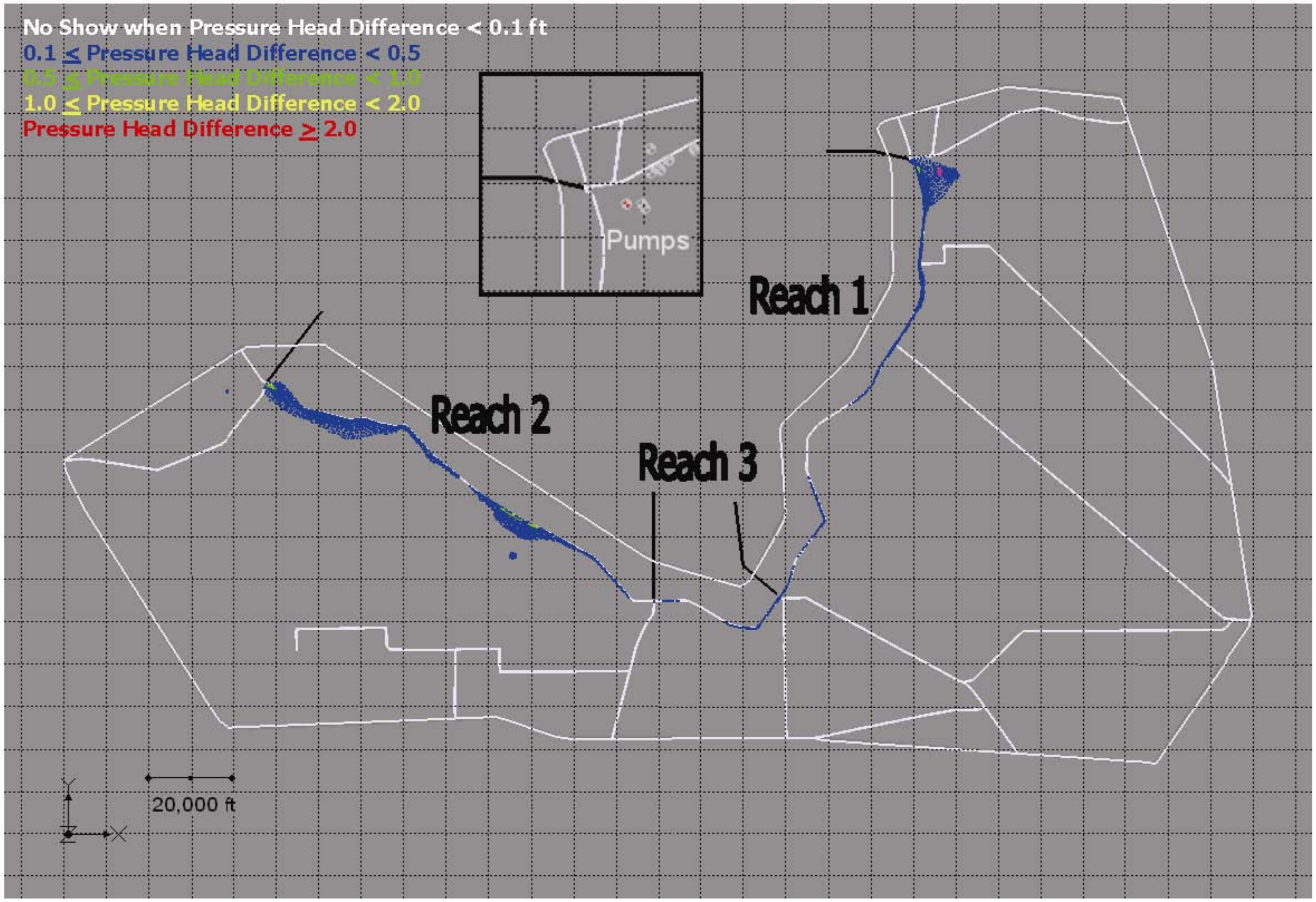


Figure F18. Pressure head comparison between "with project" and “with project” runs in Stage 2 analysis: medium net recharge and head boundary conditions, high pumping, high L2-1 K, low L3A K, and high L3B-2 K. (Set C: Run66 - Run18).

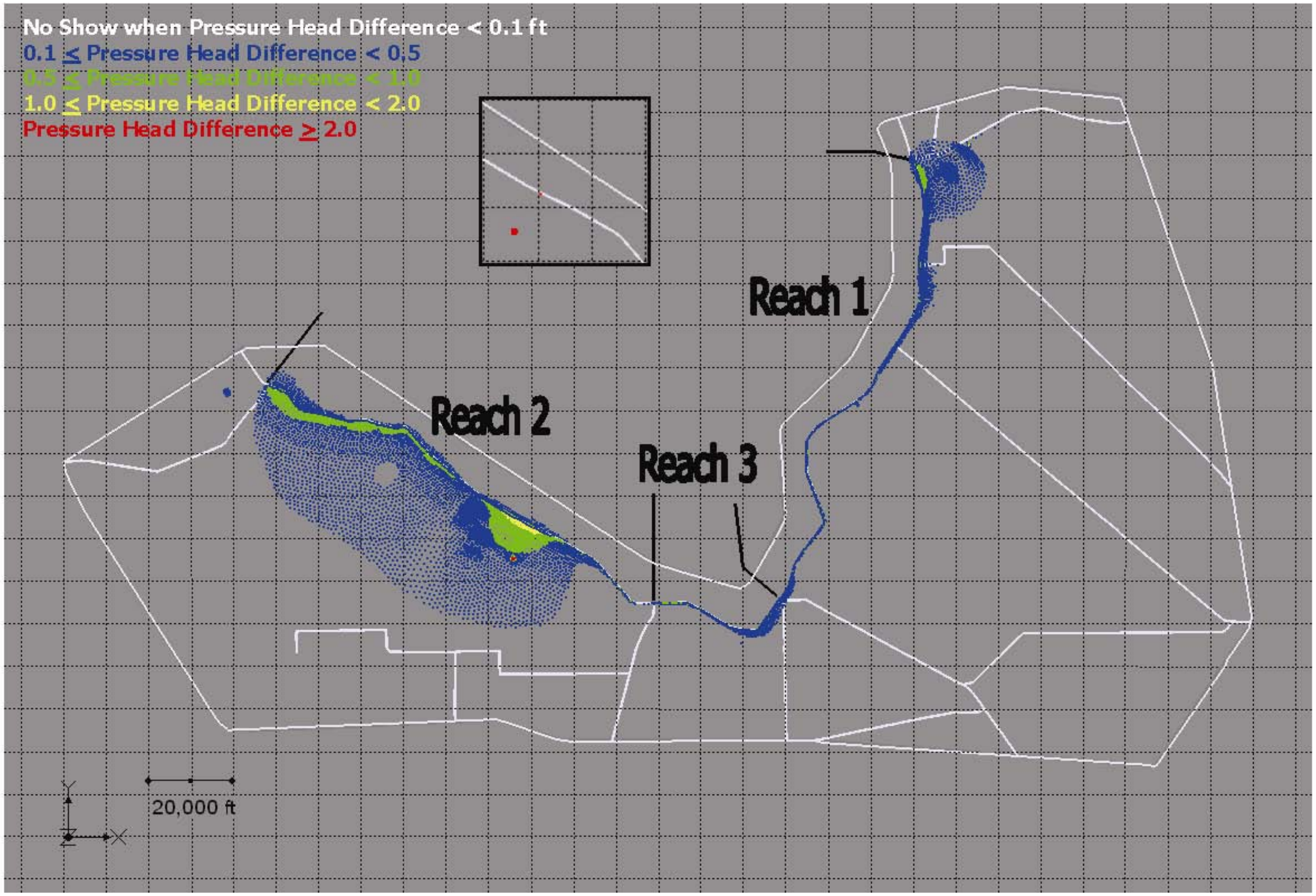


Figure F19. Pressure head comparison between "with project" and “with project” runs in Stage 2 analysis: medium net recharge and head boundary conditions, high pumping, low L2-1 K, high L3A K, and high L3B-2 K. (Set C: Run67 - Run19).

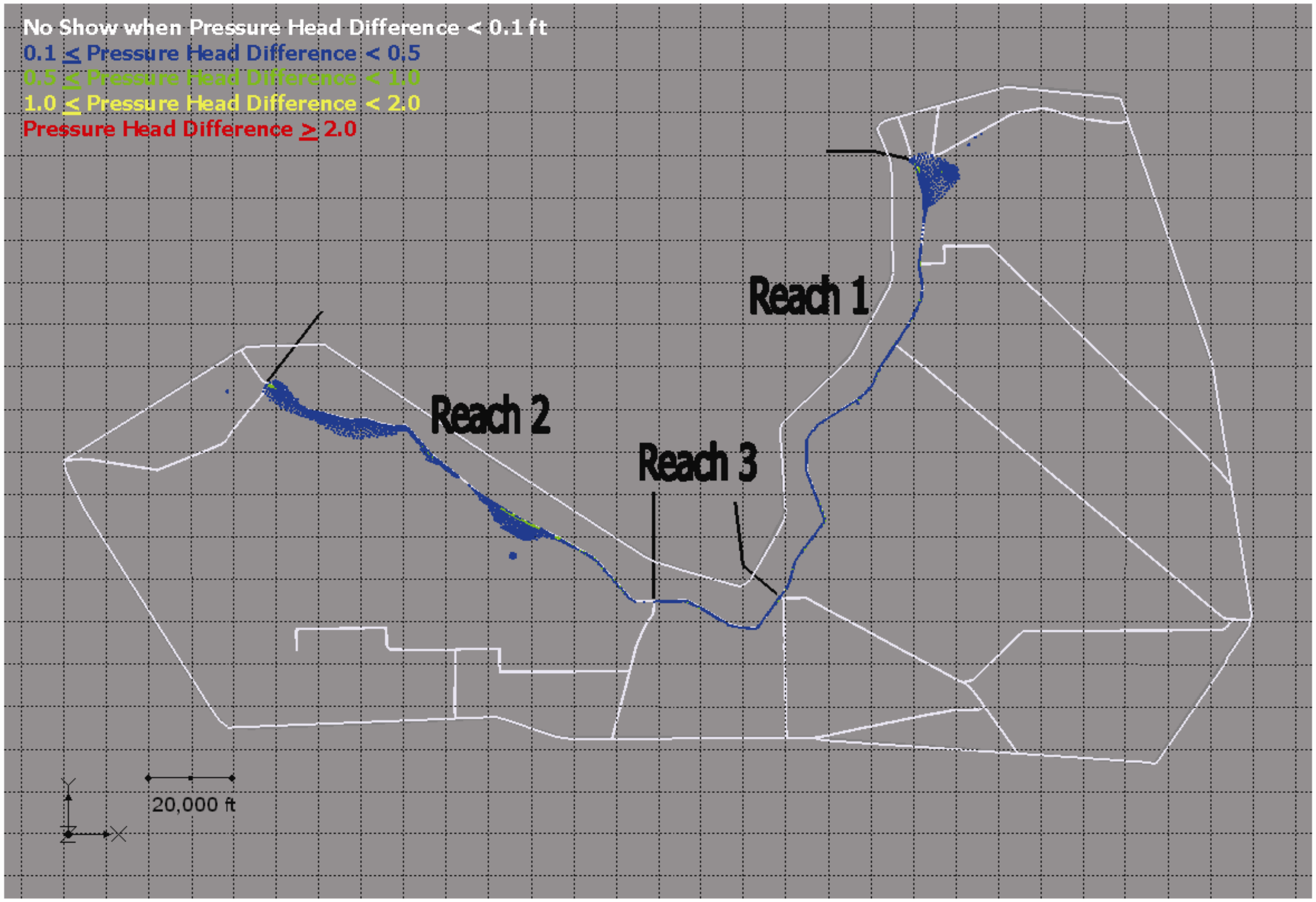


Figure F20. Pressure head comparison between "with project" and “with project” runs in Stage 2 analysis: medium net recharge and head boundary conditions, high pumping, low L2-1 K, low L3A K, and high L3B-2 K. (Set C: Run68 - Run20).

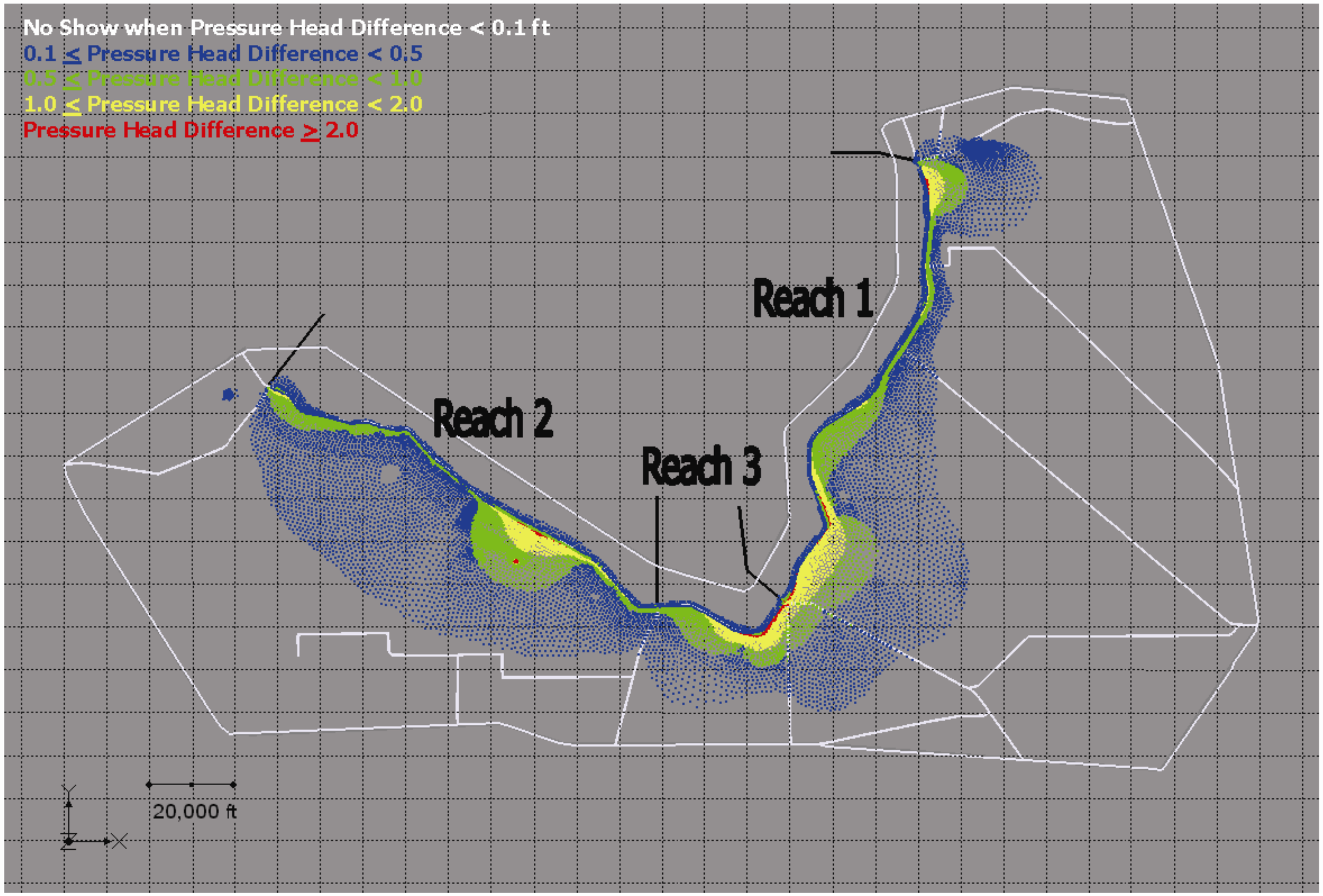


Figure F21. Pressure head comparison between "with project" and “with project” runs in Stage 2 analysis: medium net recharge and head boundary conditions, high pumping, high L2-1 K, high L3A K, and low L3B-2 K. (Set C: Run69 - Run21).

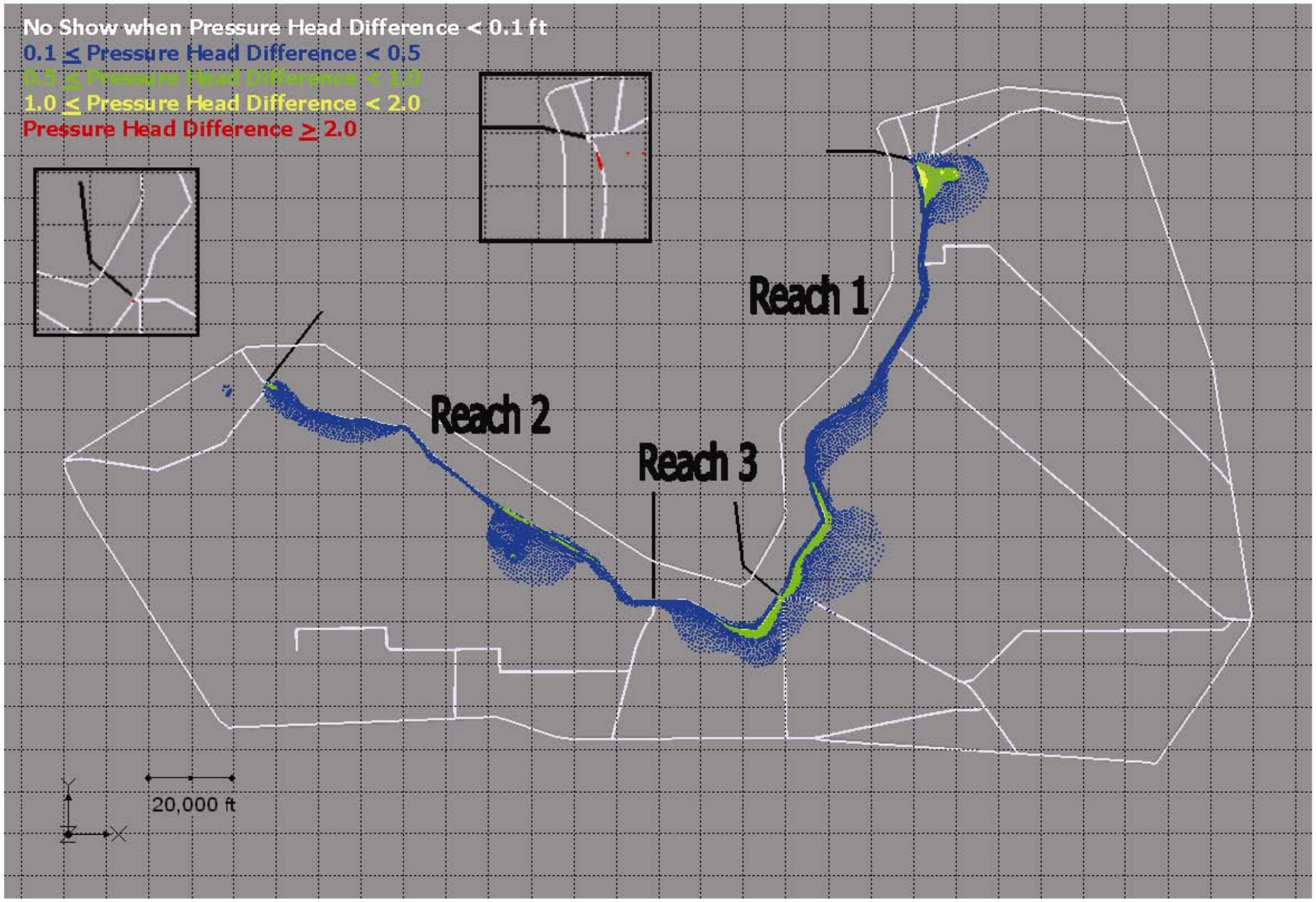


Figure F22. Pressure head comparison between "with project" and “with project” runs in Stage 2 analysis: medium net recharge and head boundary conditions, high pumping, high L2-1 K, low L3A K, and low L3B-2 K. (Set C: Run70 - Run22).

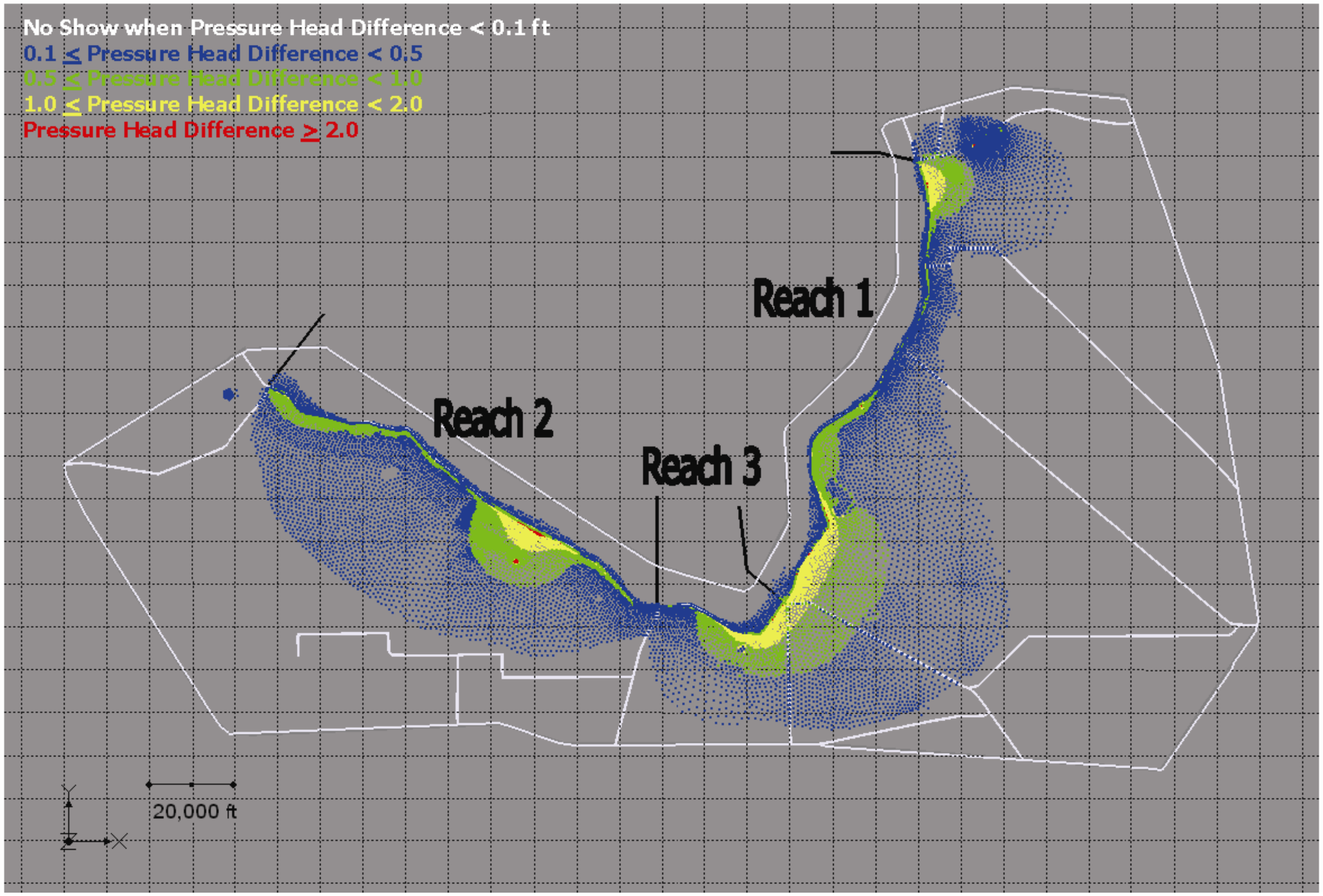


Figure F23. Pressure head comparison between "with project" and “with project” runs in Stage 2 analysis: medium net recharge and head boundary conditions, high pumping, low L2-1 K, high L3A K, and low L3B-2 K. (Set C: Run71 - Run23).

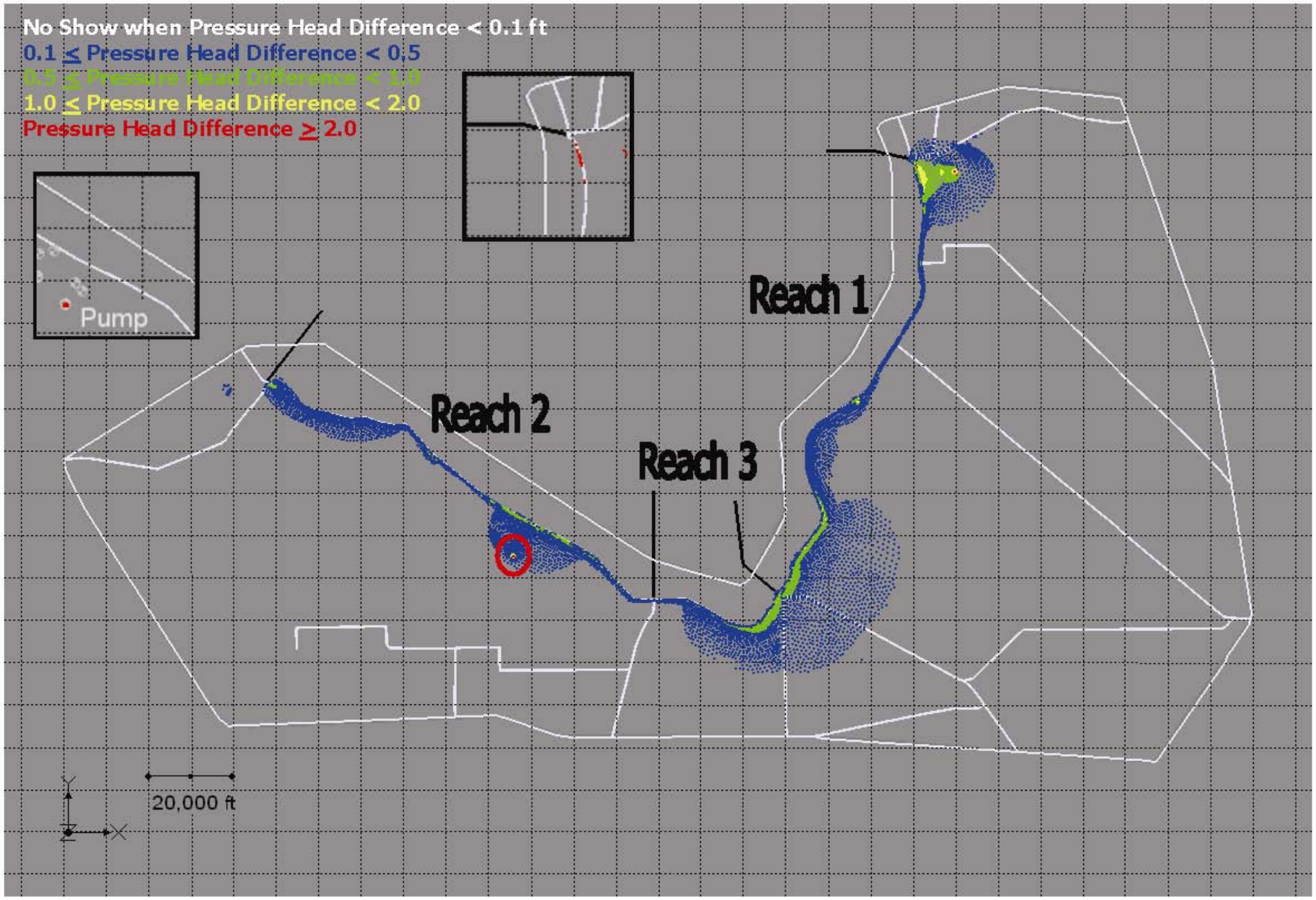


Figure F24. Pressure head comparison between "with project" and “with project” runs in Stage 2 analysis: medium net recharge and head boundary conditions, high pumping, low L2-1 K, low L3A K, and low L3B-2 K. (Set C: Run72 - Run24).

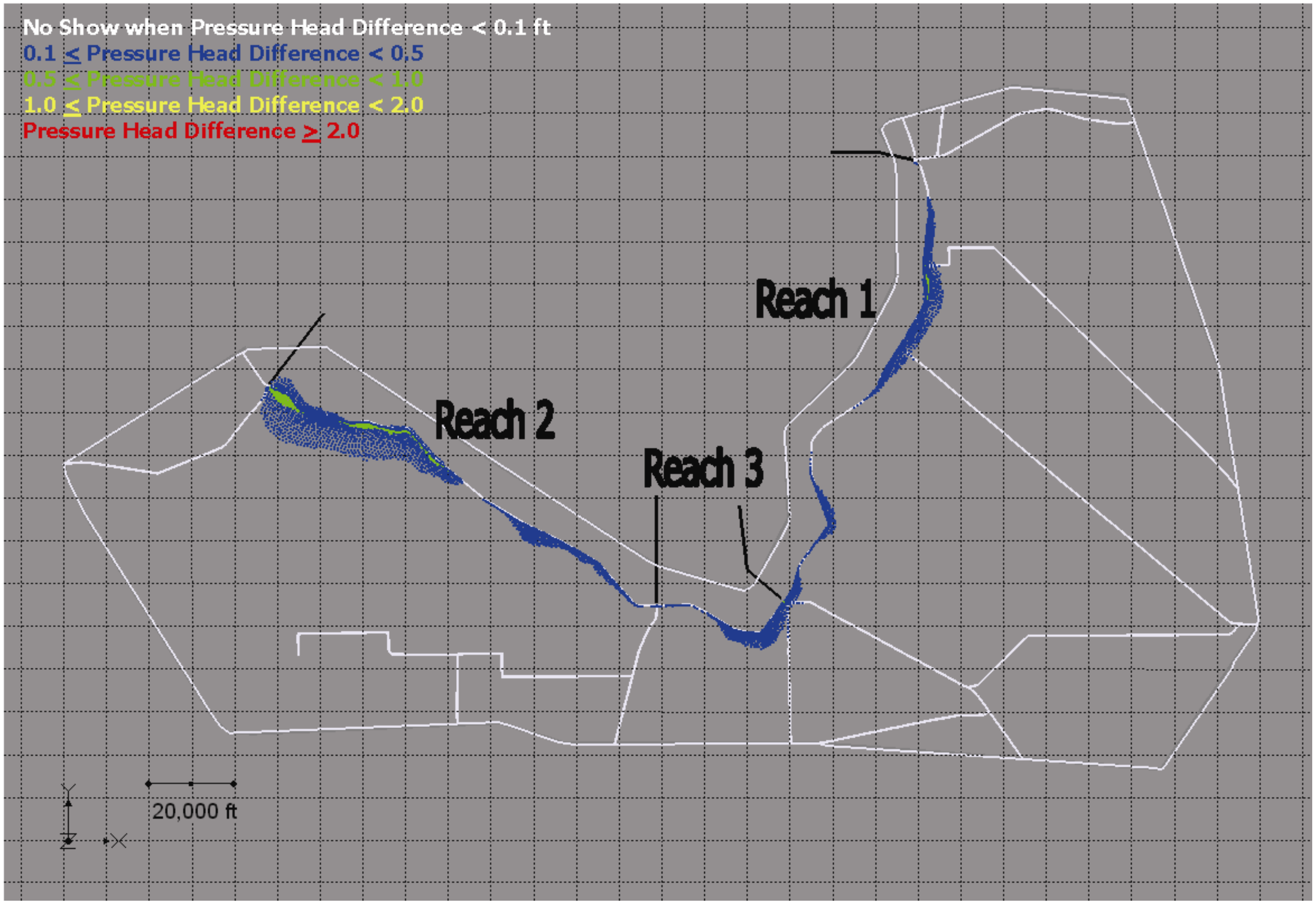


Figure F25. Pressure head comparison between "with project" and “with project” runs in Stage 2 analysis: medium net recharge and head boundary conditions, low pumping, high L2-1 K, high L3A K, and high L3B-2 K. (Set D: Run73 - Run25).

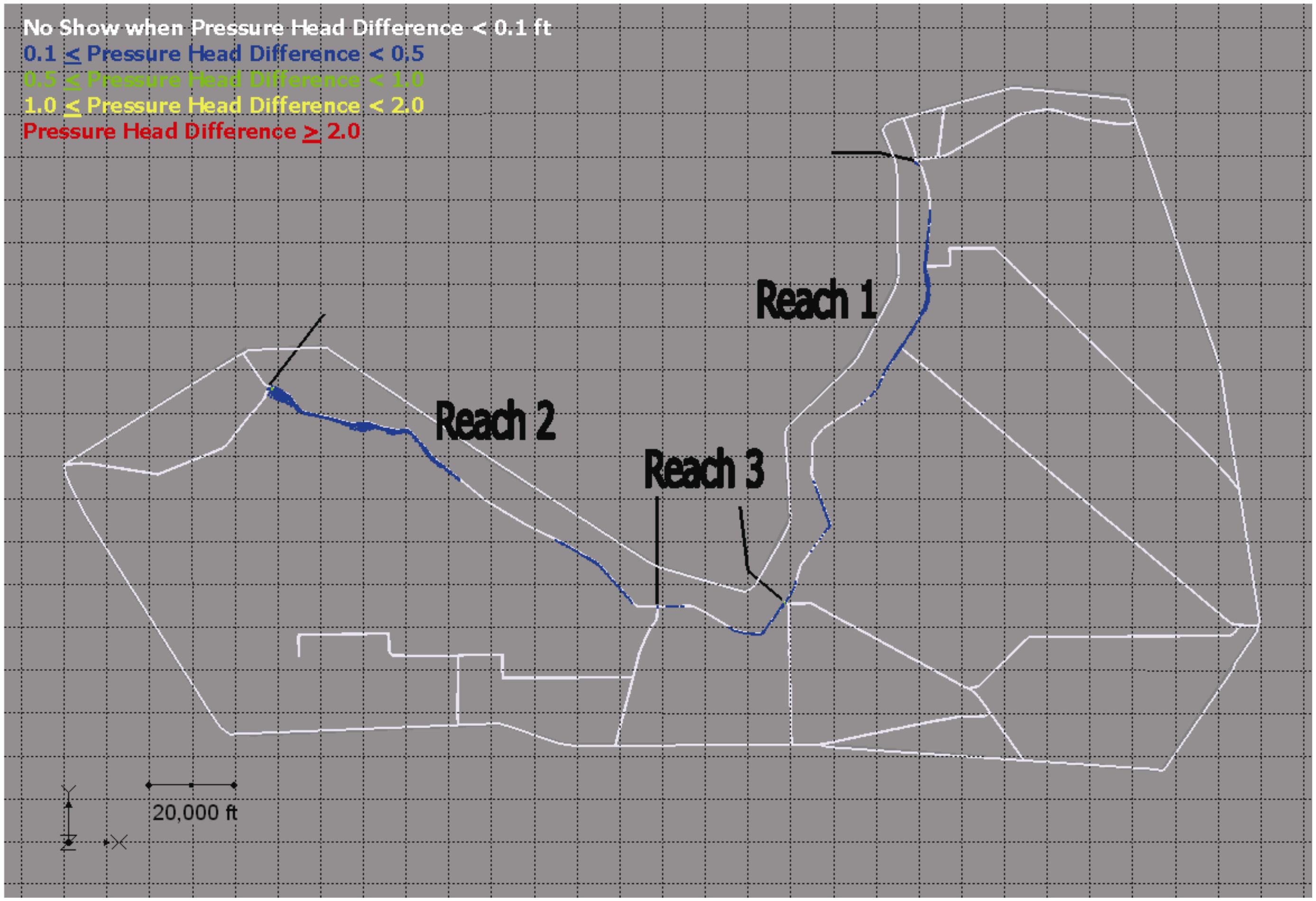


Figure F26. Pressure head comparison between "with project" and “with project” runs in Stage 2 analysis: medium net recharge and head boundary conditions, low pumping, high L2-1 K, low L3A K, and high L3B-2 K. (Set D: Run74 - Run26).

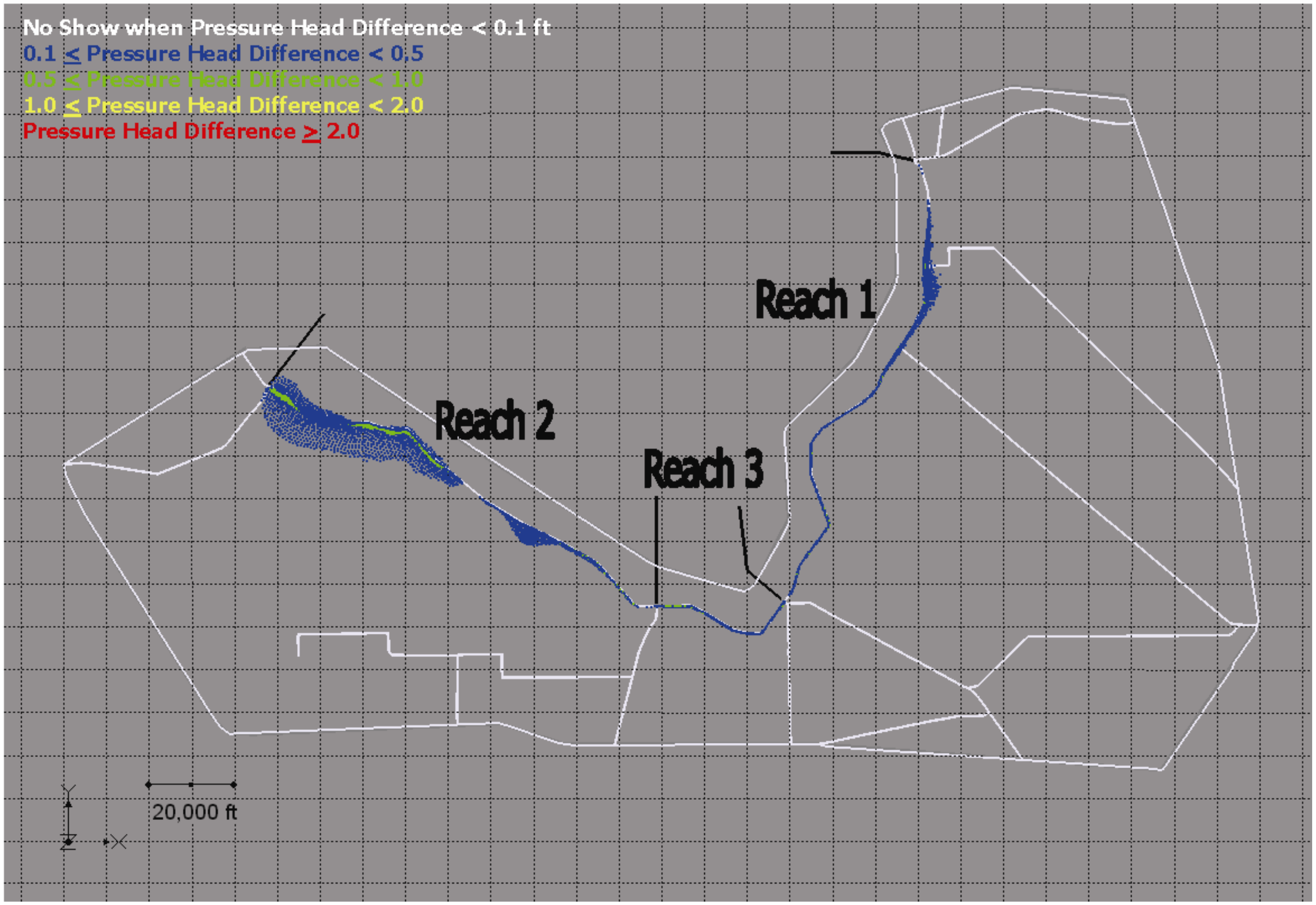


Figure F27. Pressure head comparison between "with project" and “with project” runs in Stage 2 analysis: medium net recharge and head boundary conditions, low pumping, low L2-1 K, high L3A K, and high L3B-2 K. (Set D: Run75 - Run27).

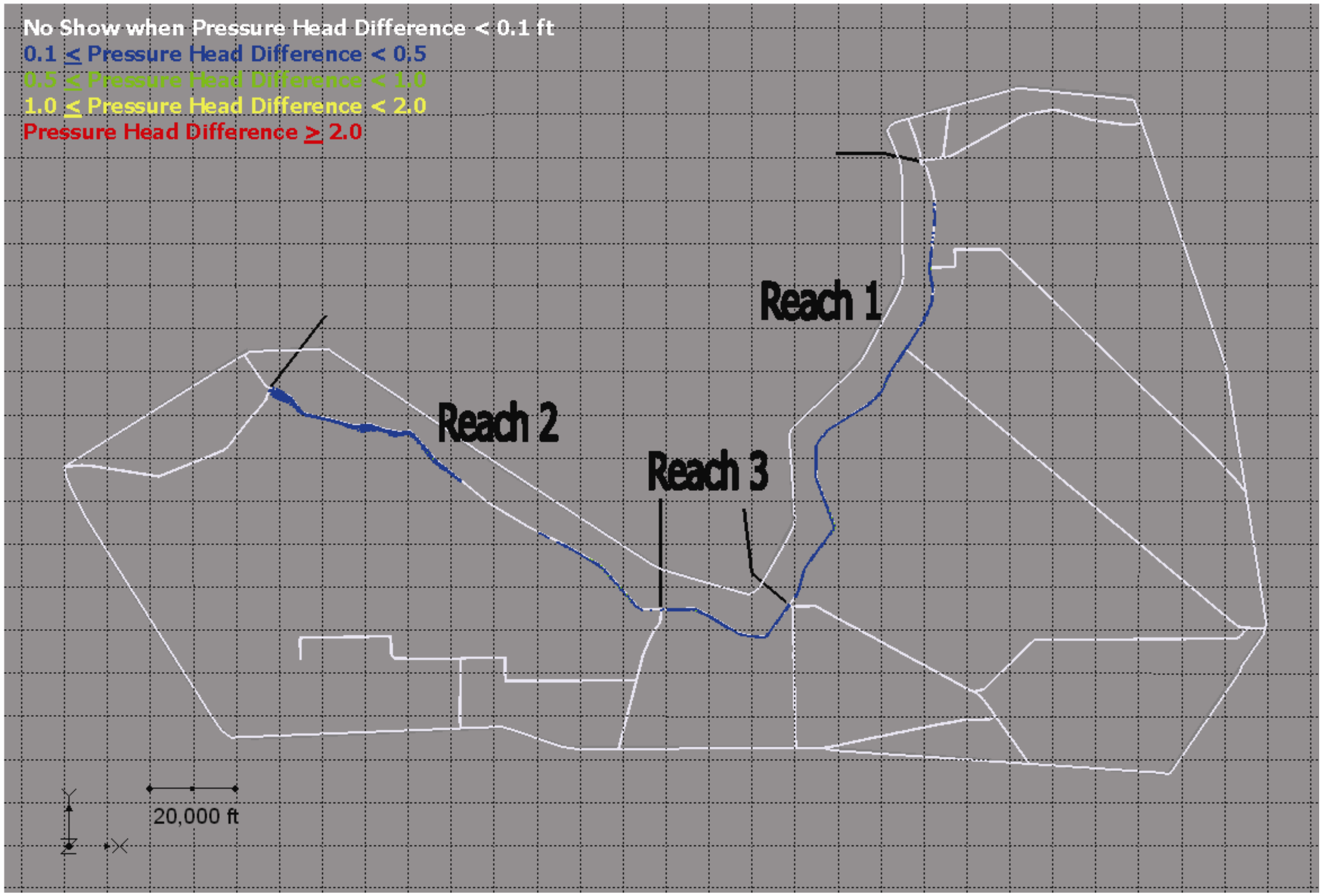


Figure F28. Pressure head comparison between "with project" and “with project” runs in Stage 2 analysis: medium net recharge and head boundary conditions, low pumping, low L2-1 K, low L3A K, and high L3B-2 K. (Set D: Run76 - Run28).

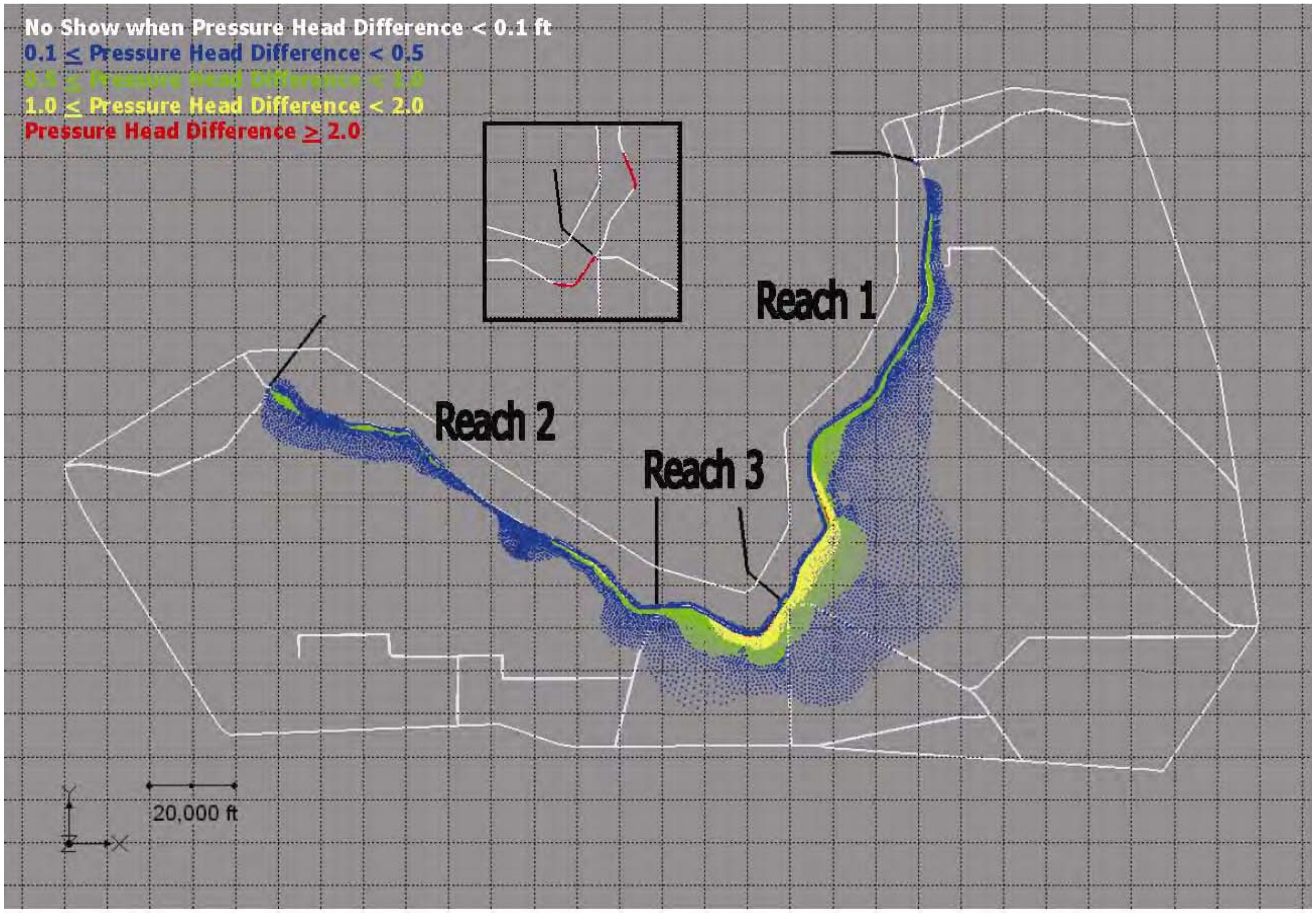


Figure F29. Pressure head comparison between "with project" and “with project” runs in Stage 2 analysis: medium net recharge and head boundary conditions, low pumping, high L2-1 K, high L3A K, and low L3B-2 K. (Set D: Run77 - Run29).

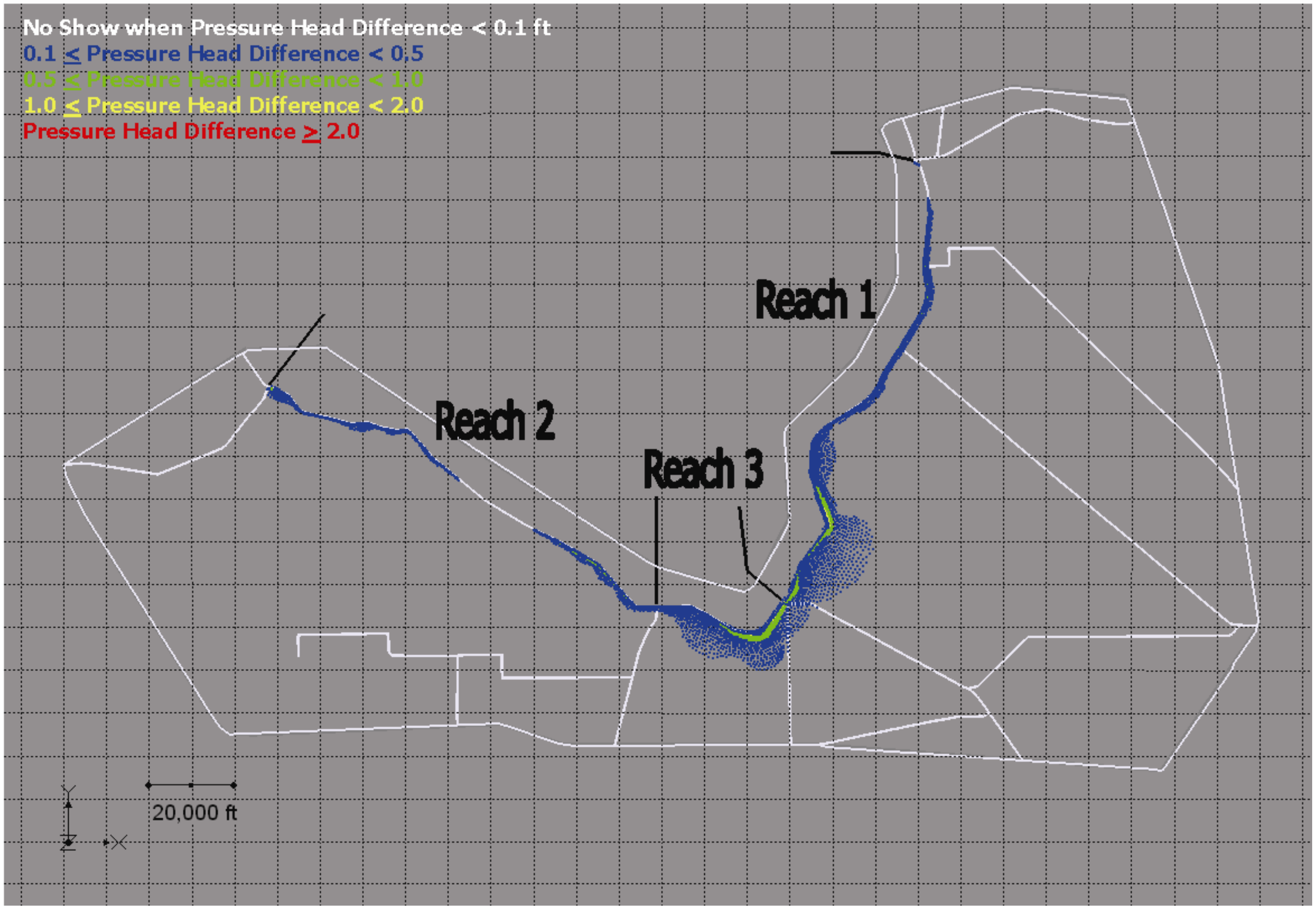


Figure F30. Pressure head comparison between "with project" and “with project” runs in Stage 2 analysis: medium net recharge and head boundary conditions, low pumping, high L2-1 K, low L3A K, and low L3B-2 K. (Set D: Run78 - Run30).

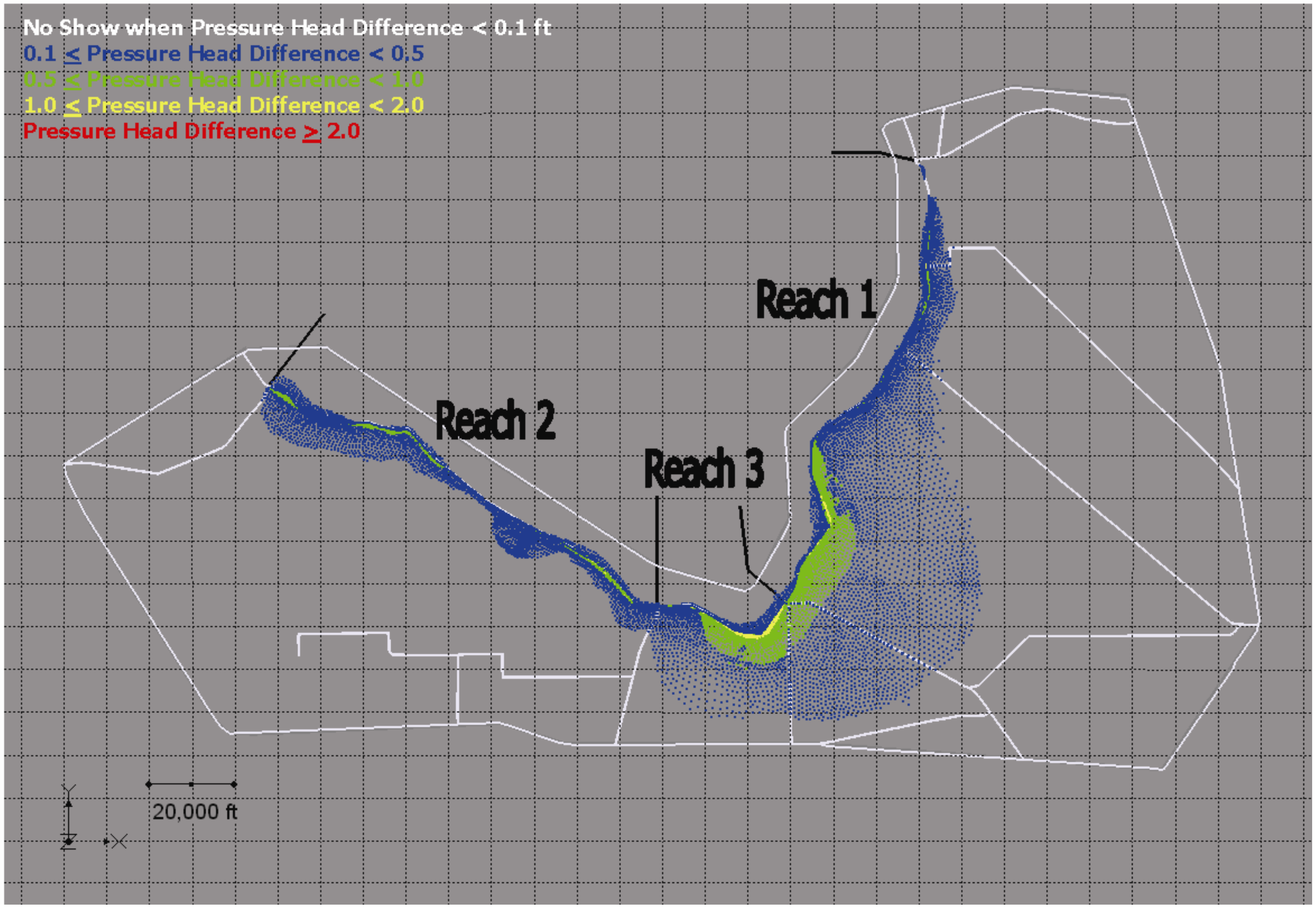


Figure F31. Pressure head comparison between "with project" and “with project” runs in Stage 2 analysis: medium net recharge and head boundary conditions, low pumping, low L2-1 K, high L3A K, and low L3B-2 K. (Set D: Run79 - Run31).

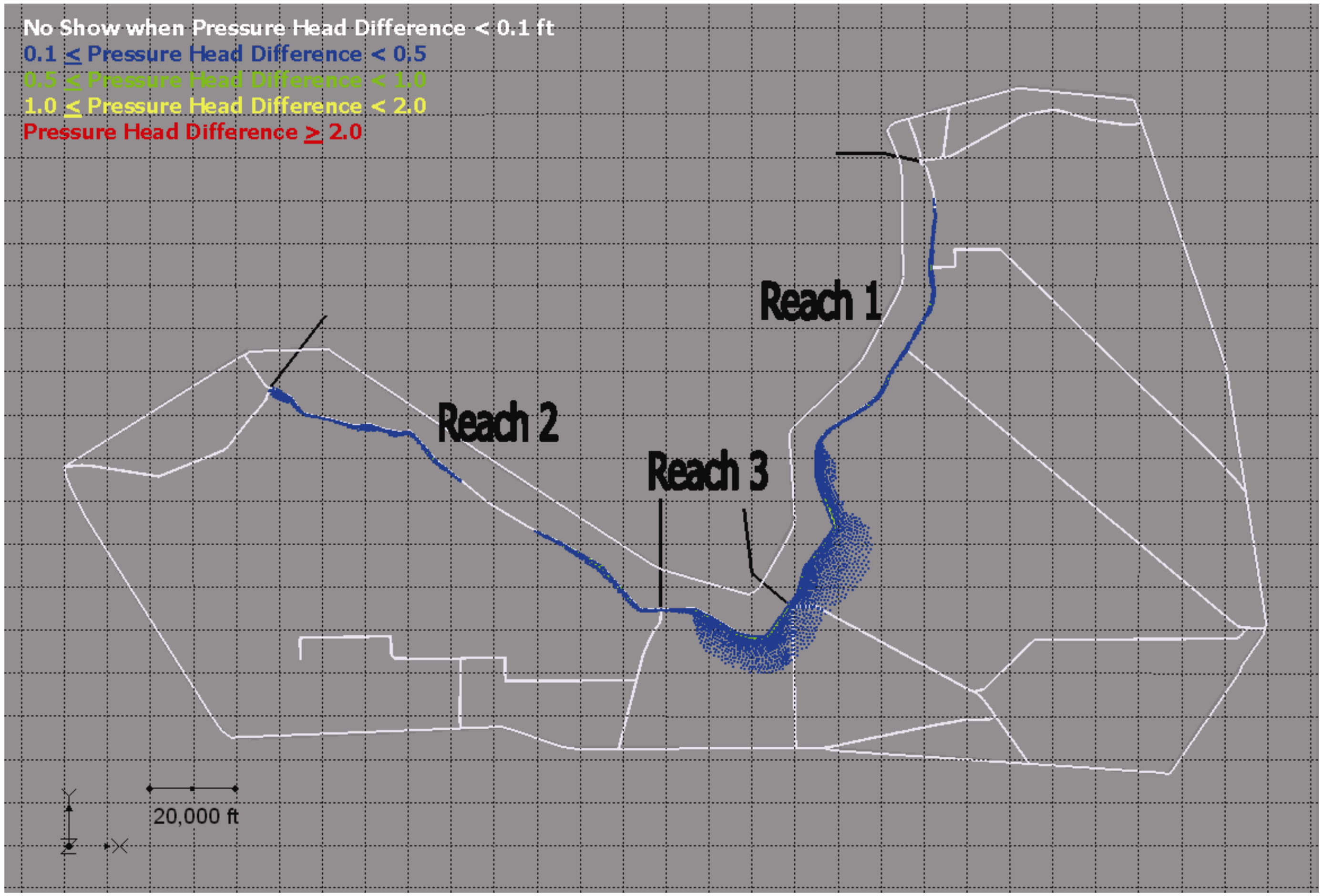


Figure F32. Pressure head comparison between "with project" and “with project” runs in Stage 2 analysis: medium net recharge and head boundary conditions, low pumping, low L2-1 K, low L3A K, and low L3B-2 K. (Set D: Run80 - Run32).

Figure F33. Pressure head comparison between "with project" and “with project” runs in Stage 2 analysis: low net recharge and head boundary conditions, high pumping, high L2-1 K, high L3A K, and high L3B-2 K. (Set E: Run81 - Run33).

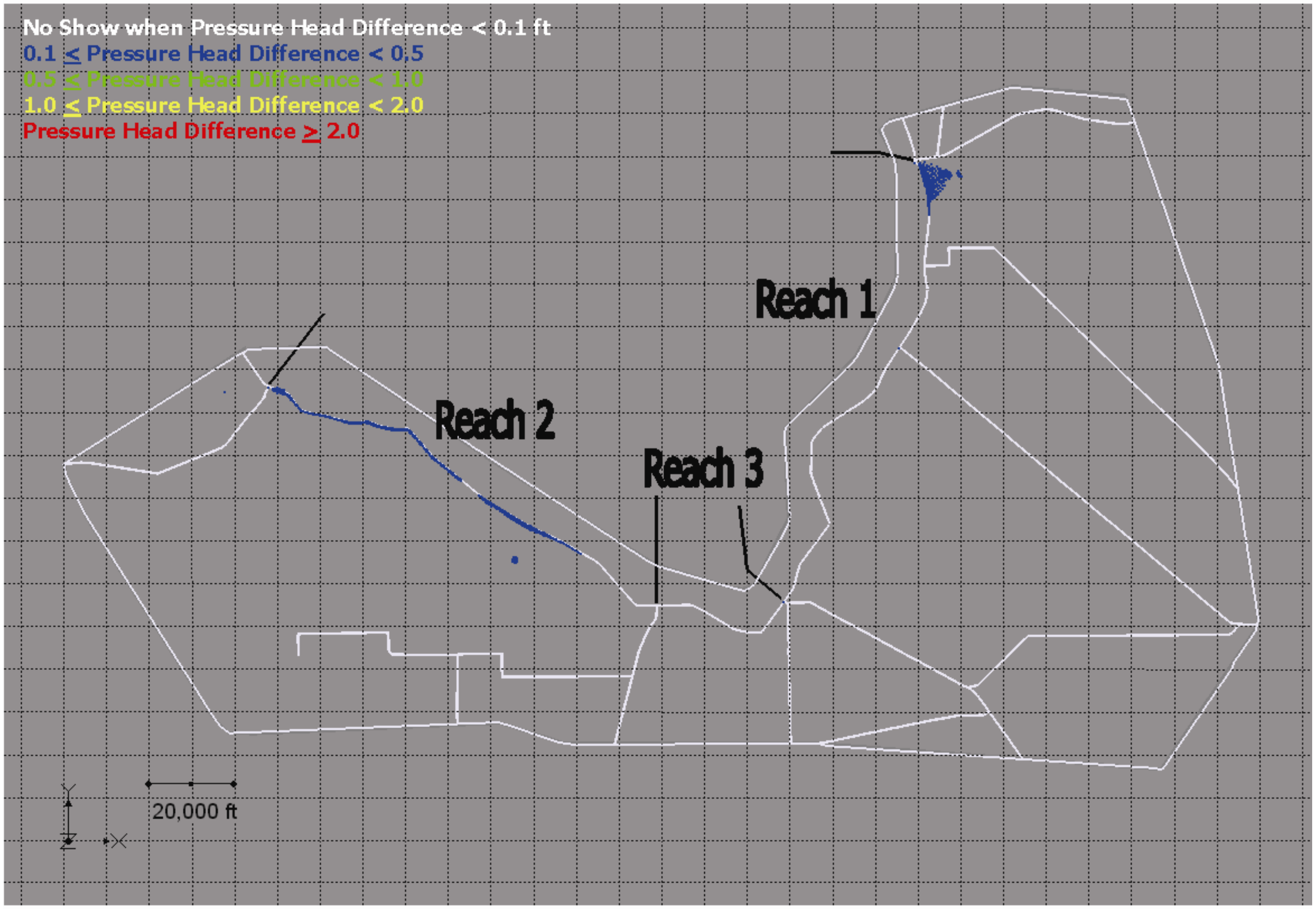


Figure F34. Pressure head comparison between "with project" and “with project” runs in Stage 2 analysis: low net recharge and head boundary conditions, high pumping, high L2-1 K, low L3A K, and high L3B-2 K. (Set E: Run 82 - Run34).

Figure F35. Pressure head comparison between "with project" and “with project” runs in Stage 2 analysis: low net recharge and head boundary conditions, high pumping, low L2-1 K, high L3A K, and high L3B-2 K. (Set E: Run83 - Run35).

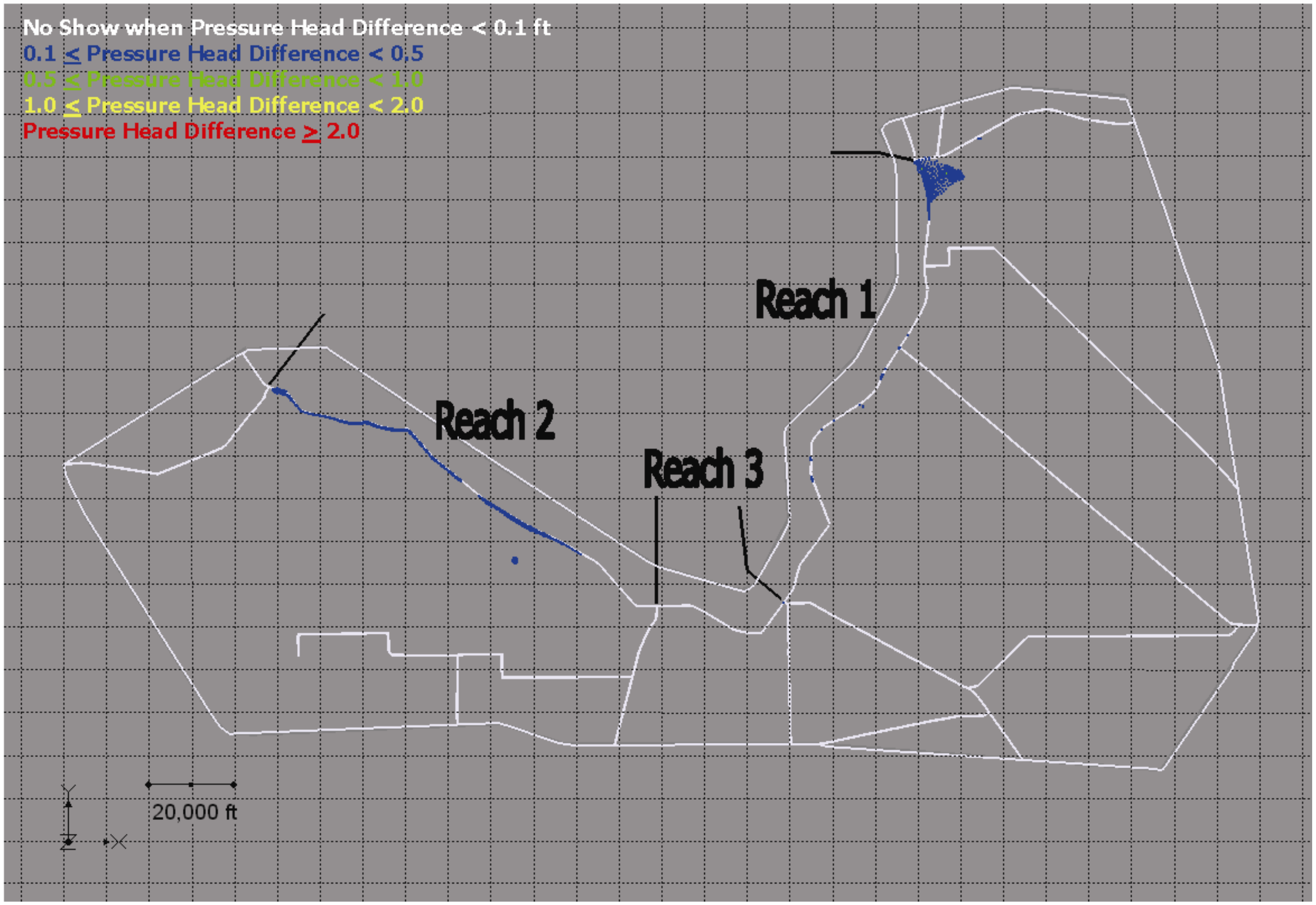


Figure F36. Pressure head comparison between "with project" and “with project” runs in Stage 2 analysis: low net recharge and head boundary conditions, high pumping, low L2-1 K, low L3A K, and high L3B-2 K. (Set E: Run84 - Run36).

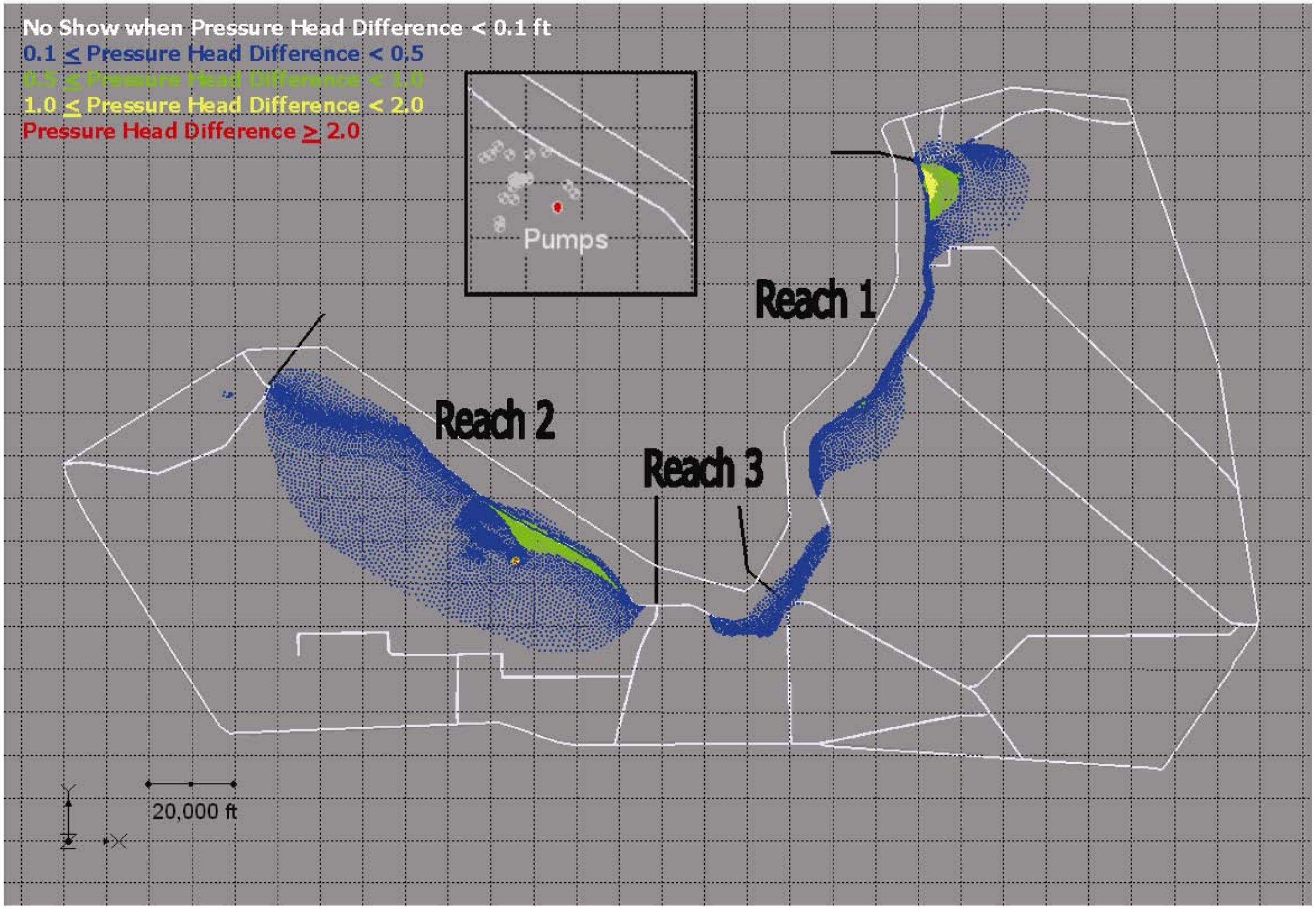


Figure F37. Pressure head comparison between "with project" and “with project” runs in Stage 2 analysis: low net recharge and head boundary conditions, high pumping, high L2-1 K, high L3A K, and low L3B-2 K. (Set E: Run85 - Run37).

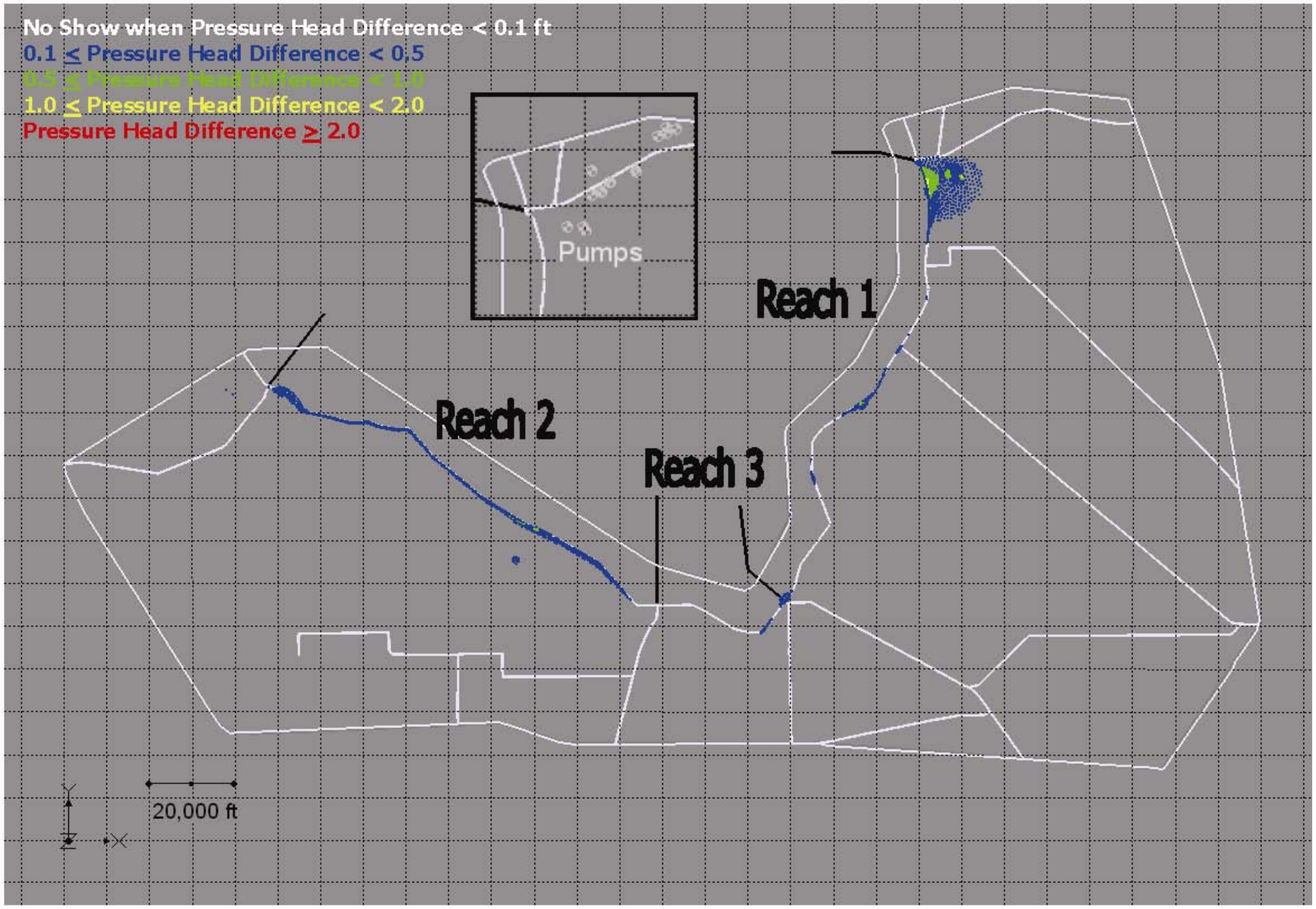


Figure F38. Pressure head comparison between "with project" and "with project" runs in Stage 2 analysis: low net recharge and head boundary conditions, high pumping, high L2-1 K, low L3A K, and low L3B-2 K. (Set E: Run86 - Run38).

Figure F39. Pressure head comparison between "with project" and “with project” runs in Stage 2 analysis: low net recharge and head boundary conditions, high pumping, low L2-1 K, high L3A K, and low L3B-2 K. (Set E: Run87 - Run39).

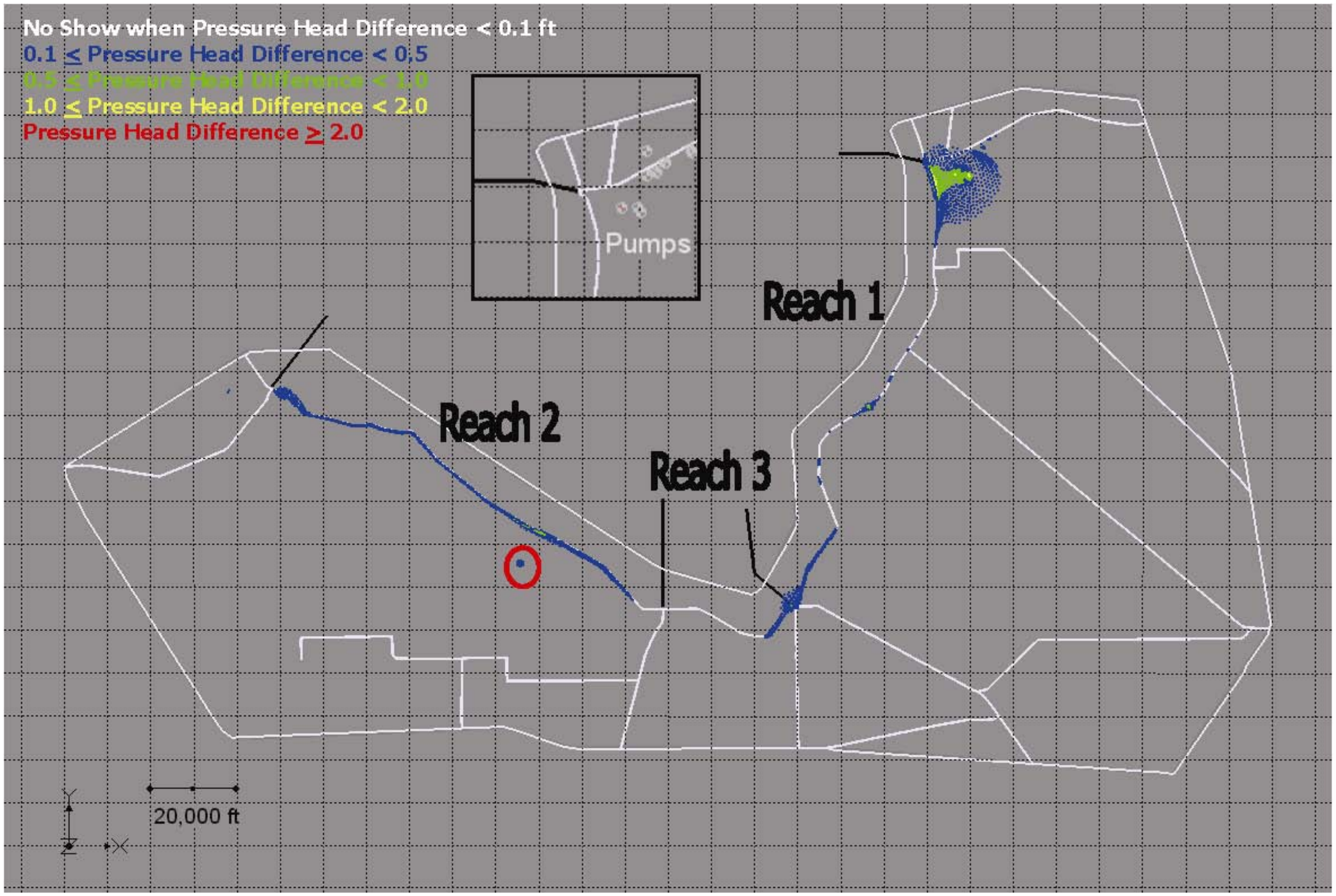


Figure F40. Pressure head comparison between "with project" and “with project” runs in Stage 2 analysis: low net recharge and head boundary conditions, high pumping, low L2-1 K, low L3A K, and low L3B-2 K. (Set E: Run88 - Run40).

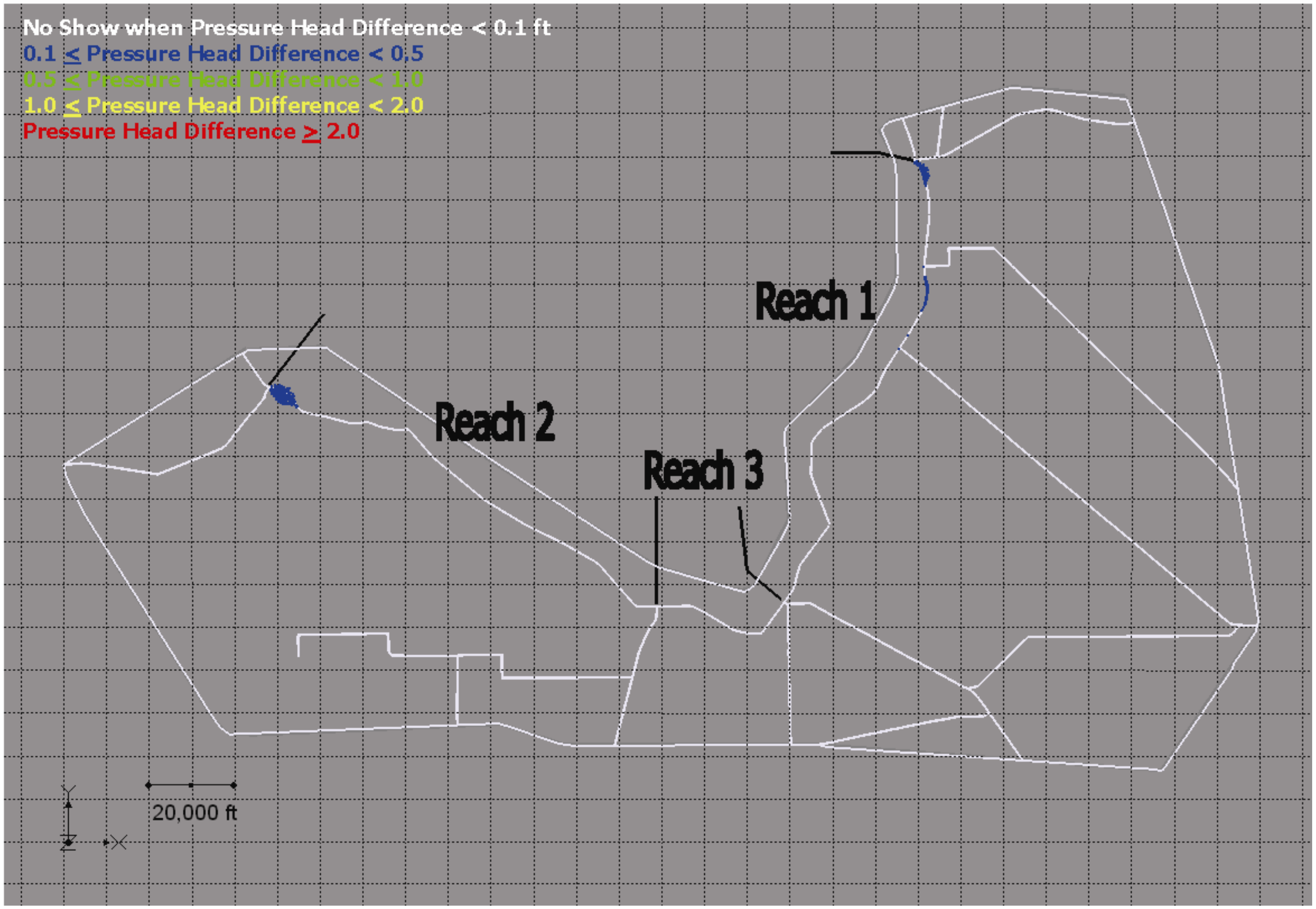


Figure F41. Pressure head comparison between "with project" and “with project” runs in Stage 2 analysis: low net recharge and head boundary conditions, low pumping, high L2-1 K, high L3A K, and high L3B-2 K. (Set F: Run 89 – Run41).

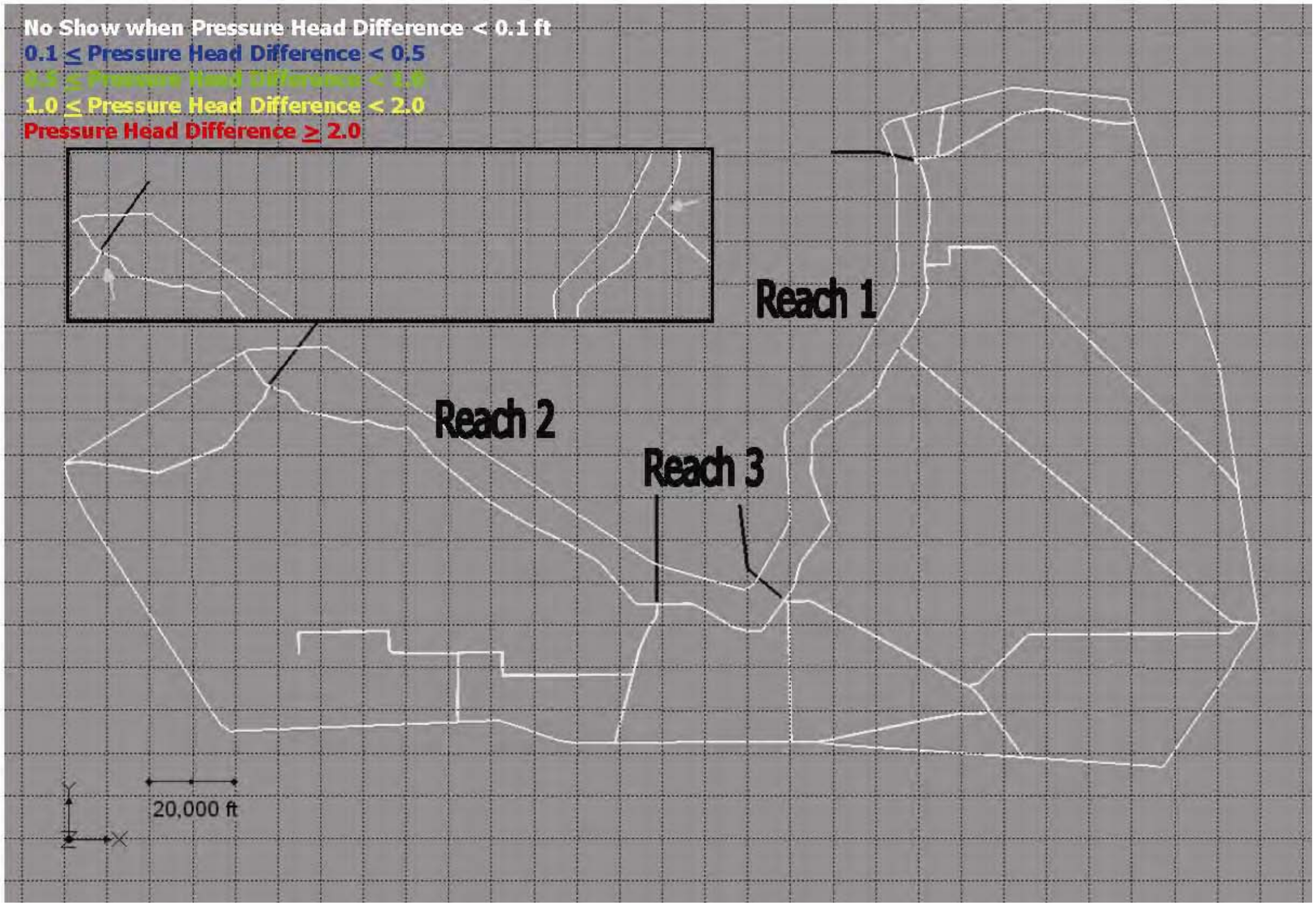


Figure F42. Pressure head comparison between "with project" and “with project” runs in Stage 2 analysis: low net recharge and head boundary conditions, low pumping, high L2-1 K, low L3A K, and high L3B-2 K. (Set F: Run90 - Run42).

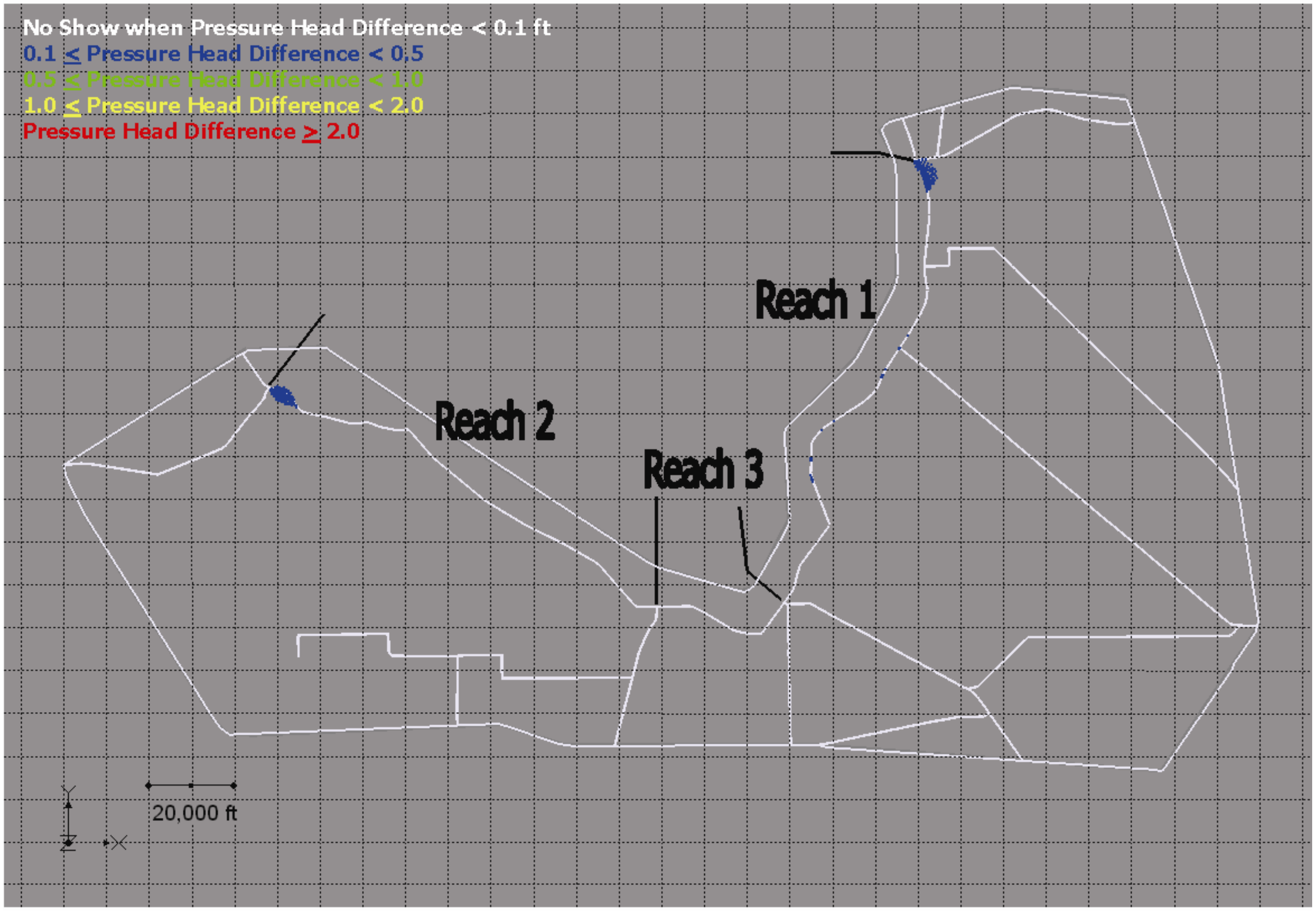


Figure F43. Pressure head comparison between "with project" and “with project” runs in Stage 2 analysis: low net recharge and head boundary conditions, low pumping, low L2-1 K, high L3A K, and high L3B-2 K. (Set F: Run91 – Run43).

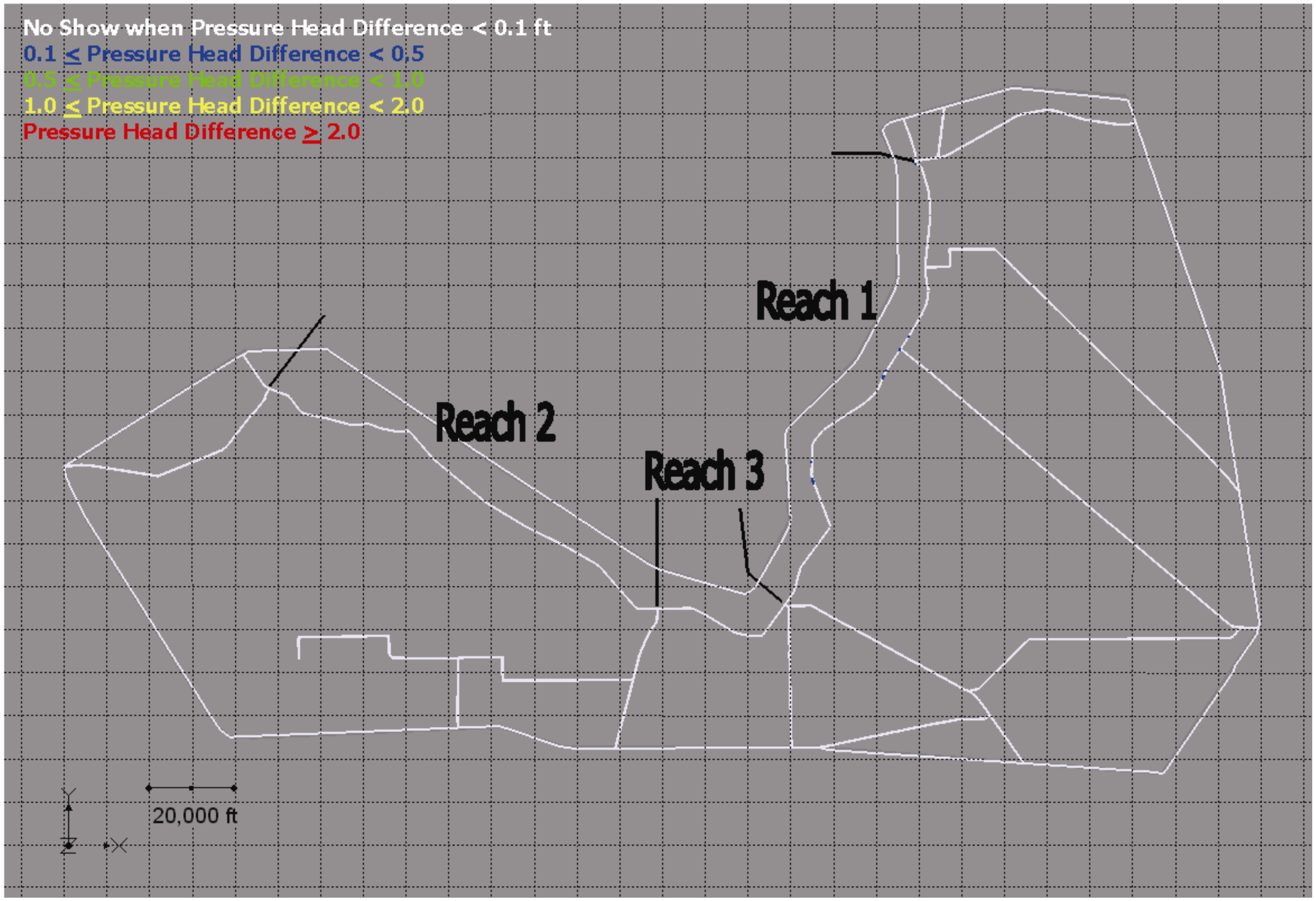


Figure F44. Pressure head comparison between "with project" and “with project” runs in Stage 2 analysis: low net recharge and head boundary conditions, low pumping, low L2-1 K, low L3A K, and high L3B-2 K. (Set F: Run92 – Run44).

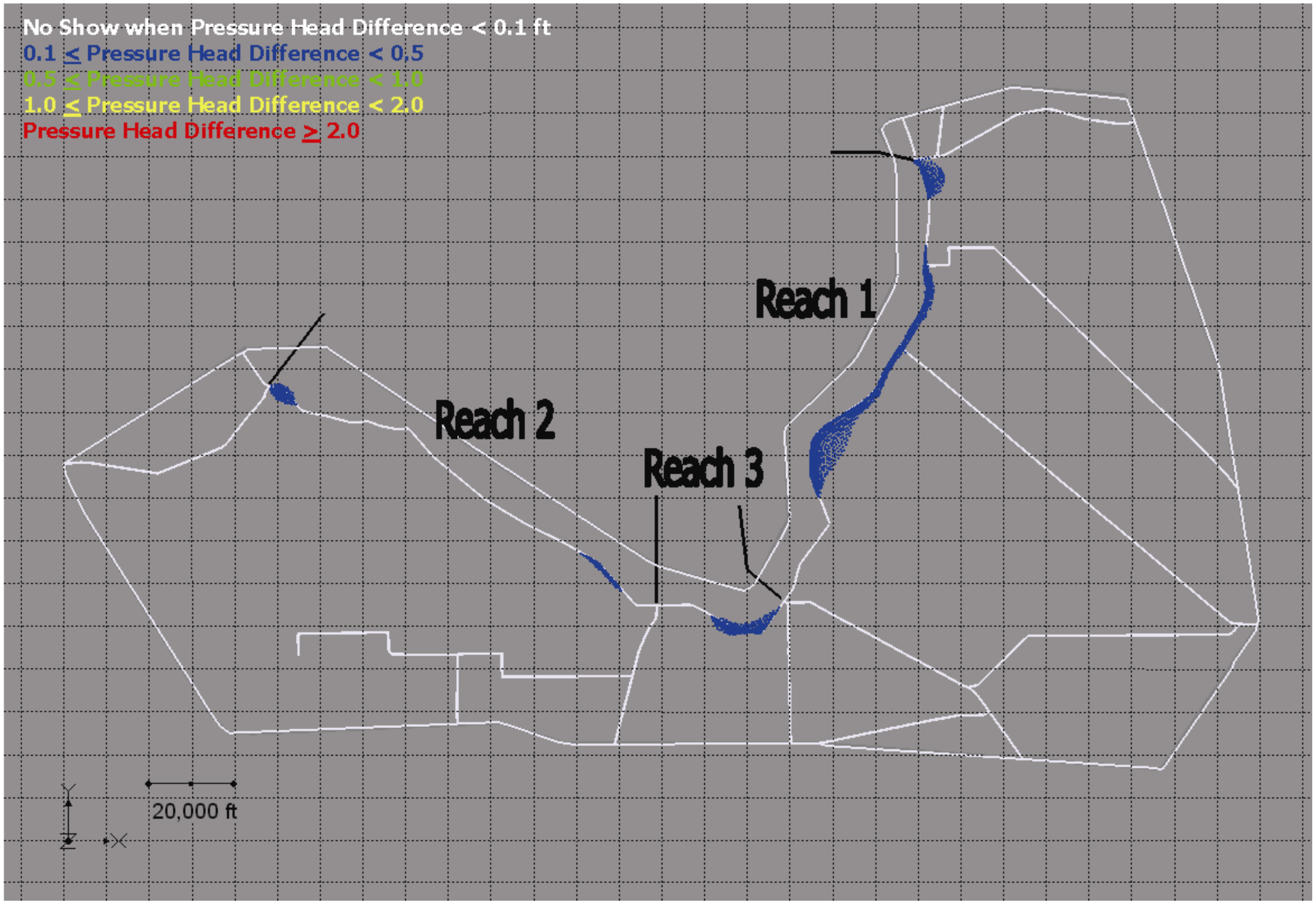


Figure F45. Pressure head comparison between "with project" and “with project” runs in Stage 2 analysis: low net recharge and head boundary conditions, low pumping, high L2-1 K, high L3A K, and low L3B-2 K. (Set F: Run93 – Run45).

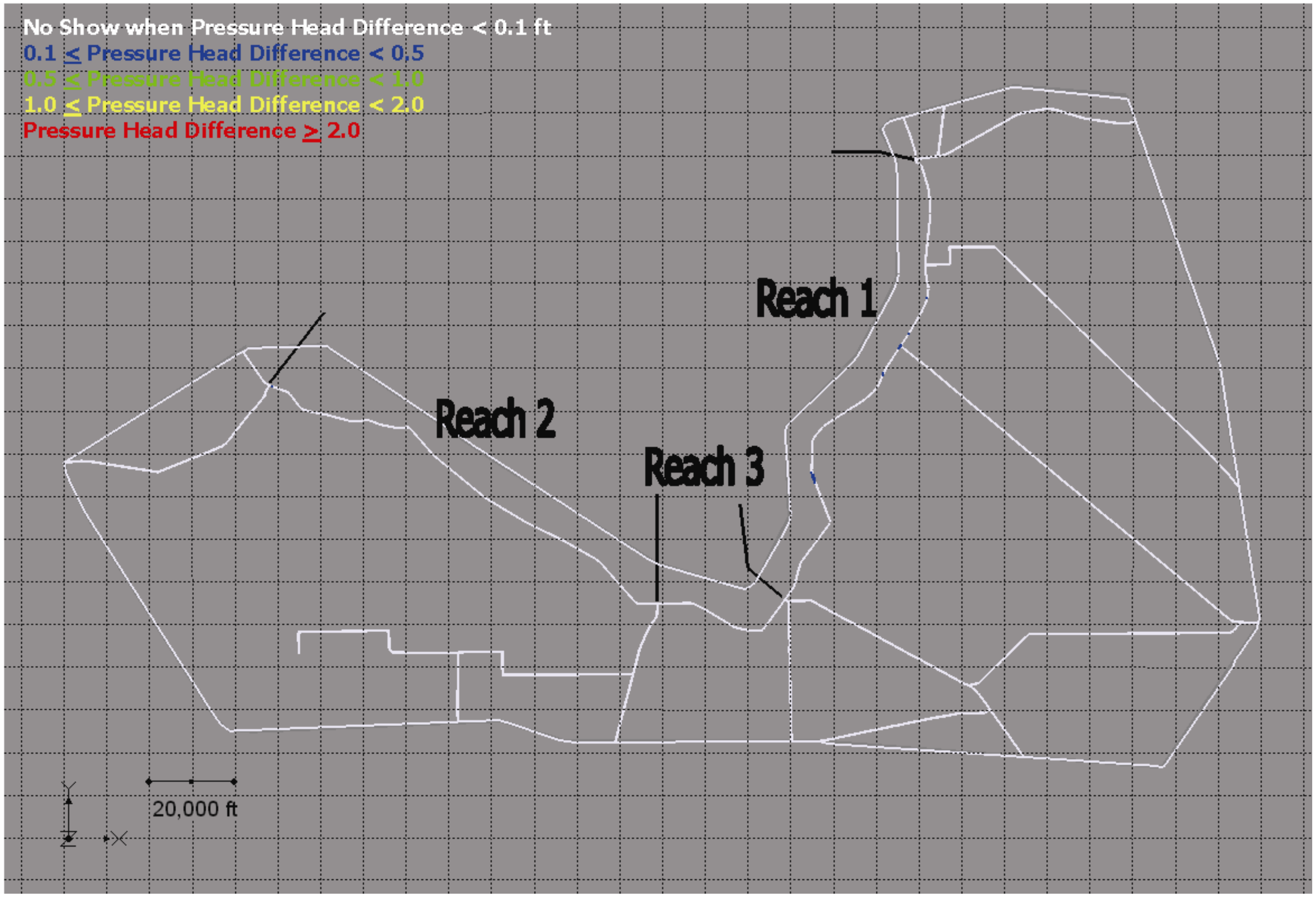


Figure F46. Pressure head comparison between "with project" and “with project” runs in Stage 2 analysis: low net recharge and head boundary conditions, low pumping, high L2-1 K, low L3A K, and low L3B-2 K. (Set F: Run94 – Run46).

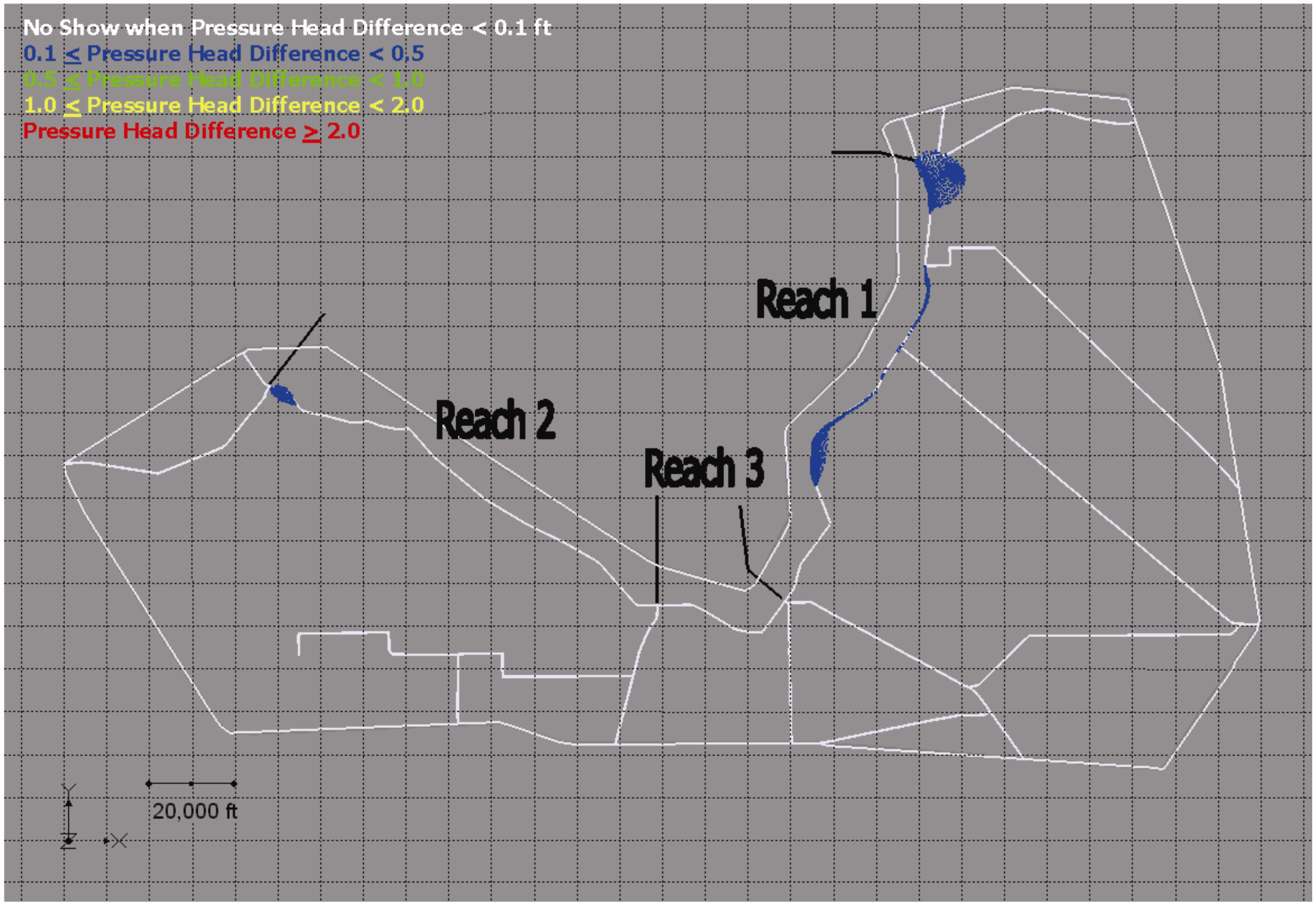


Figure F47. Pressure head comparison between "with project" and “with project” runs in Stage 2 analysis: low net recharge and head boundary conditions, low pumping, low L2-1 K, high L3A K, and low L3B-2 K. (Set F: Run95 – Run47).

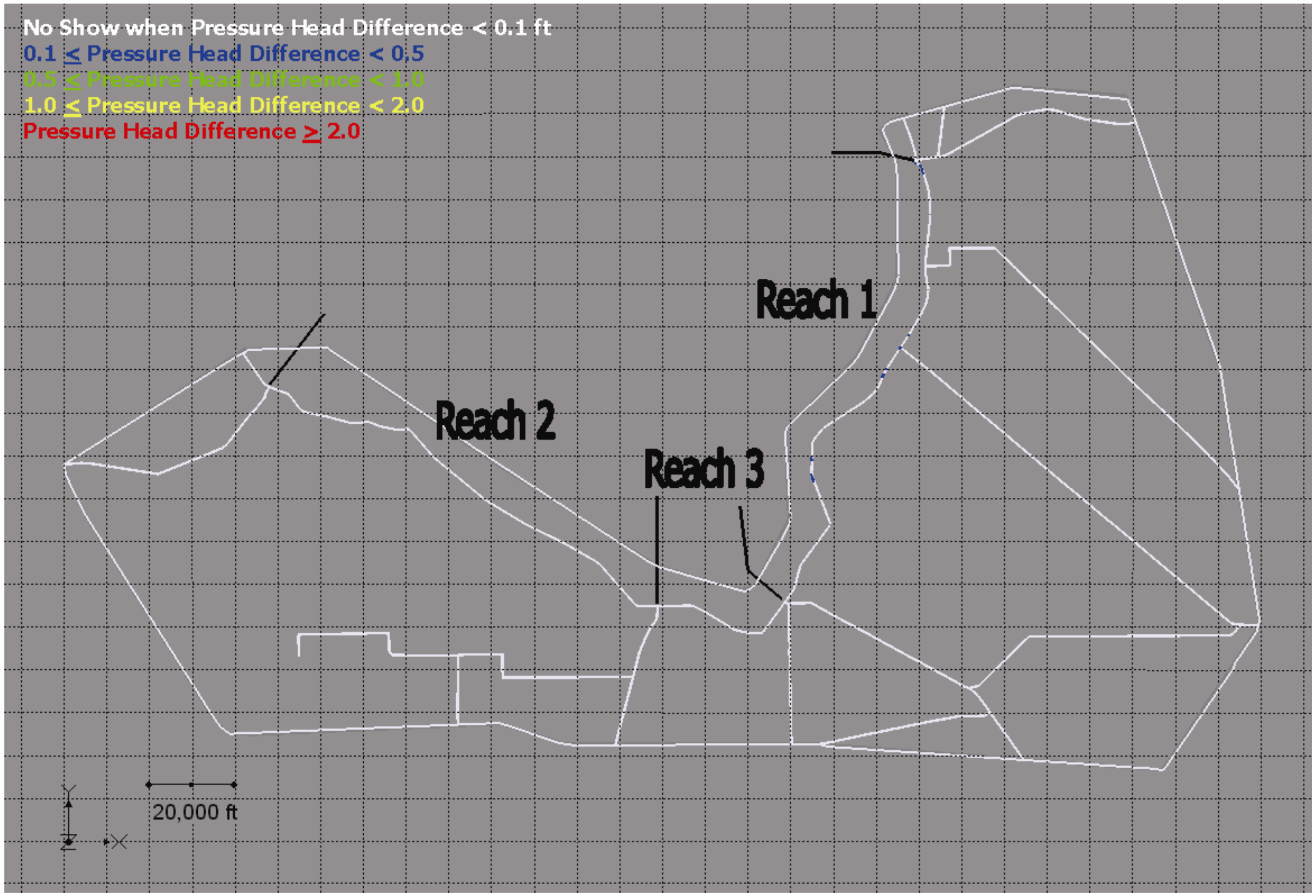


Figure F48. Pressure head comparison between "with project" and “with project” runs in Stage 2 analysis: low net recharge and head boundary conditions, low pumping, low L2-1 K, low L3A K, and low L3B-2 K. (Set F: Run96 - Run48).

Table F1. Eight pressure head comparisons between "with project" and "without project" runs with high net recharge and head boundary conditions and high pumping in Stage 2 analysis (i.e., eight comparisons in Set A).

ID*	Pressure Head Comparison (w/ project - w/o project)	0.1 ≤ Diff ≤ 0.5 % Occurrences	0.5 ≤ Diff ≤ 1.0 % Occurrences	1.0 ≤ Diff ≤ 2.0 % Occurrences	Diff ≥ 2.0 % Occurrences	MA Diff (ft)	RMS Diff (ft)	Max Diff (ft)
1	Run49 - Run1	18.303%	3.491%	1.227%	0.099%	0.0967	0.2425	**3.98**
2	Run50 - Run2	8.758%	0.711%	0.039%	0.000%	0.0324	0.0905	**1.77**
3	Run51 - Run3	15.436%	3.420%	1.122%	0.104%	0.0930	0.2385	**4.43**
4	Run52 - Run4	8.844%	0.948%	0.094%	0.000%	0.0370	0.1015	**1.48**
5	Run53 - Run5	20.404%	11.537%	8.027%	1.951%	0.3068	0.6107	**7.83**
6	Run54 - Run6	21.255%	4.779%	1.067%	0.032%	0.1040	0.2382	**2.73**
7	Run55 - Run7	25.593%	13.216%	6.437%	0.685%	0.2759	0.5213	**8.34**
8	Run56 - Run8	**22.284%**	**3.518%**	**0.667%**	**0.027%**	**0.0944**	**0.2068**	**2.68**

* The K values used for Materials L2-1, L3A, and L3B-2 are (high, high, high), (high, low, high), (low, high, high), (low, low, high), (high, high, low), (high, low, low), (low, high, low), and (low, low, low) for comparisons 1 through 8. The high and low K values for Materials L2-1, L3A, and L3B-2 are as follows.

The low and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03) and (1, 1, 0.3) ft/d

The low and high values of hydraulic conductivity for Material L3A are (100, 100, 8) and (600, 600, 48) ft/d

The low and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1) and (100, 100, 100) ft/d

Table F2. Eight pressure head comparisons between "with project" and "without project" runs with high net recharge and head boundary conditions and low pumping in Stage 2 analysis (i.e., eight comparisons in Set B).

ID*	Pressure Head Comparison (w/ project - w/o project)	0.1 ≤ Diff ≤ 0.5 % Occurrences	0.5 ≤ Diff ≤ 1.0 % Occurrences	1.0 ≤ Diff ≤ 2.0 % Occurrences	Diff ≥ 2.0 % Occurrences	MA Diff (ft)	RMS Diff (ft)	Max Diff (ft)
1	Run57 - Run9	12.864%	1.741%	0.791%	0.003%	0.0597	0.1681	**2.13**
2	Run58 - Run10	3.960%	0.404%	0.011%	0.000%	0.0189	0.0658	**1.51**
3	Run59 - Run11	8.330%	1.513%	0.580%	0.000%	0.0522	0.1490	**1.85**
4	Run60 - Run12	3.621%	0.579%	0.045%	0.000%	0.0212	0.0749	**1.41**
5	Run61 - Run13	18.006%	8.184%	6.341%	1.014%	0.2278	0.4971	**3.54**
6	Run62 - Run14	15.043%	3.253%	0.613%	0.001%	0.0723	0.1875	**2.05**
7	Run63 - Run15	23.410%	8.806%	3.415%	0.045%	0.1752	0.3455	**2.72**
8	Run64 - Run16	**14.120%**	**1.451%**	**0.170%**	**0.000%**	**0.0554**	**0.1357**	**1.81**

* The K values used for Materials L2-1, L3A, and L3B-2 are (high, high, high), (high, low, high), (low, high, high), (low, low, high), (high, high, low), (high, low, low), (low, high, low), and (low, low, low) for comparisons 1 through 8. The high and low K values for Materials L2-1, L3A, and L3B-2 are as follows.

The low and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03) and (1, 1, 0.3) ft/d

The low and high values of hydraulic conductivity for Material L3A are (100, 100, 8) and (600, 600, 48) ft/d

The low and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1) and (100, 100, 100) ft/d

Table F3. Eight pressure head comparisons between "with project" and "without project" runs with medium net recharge and head boundary conditions and high pumping in Stage 2 analysis (i.e., eight comparisons in Set C).

ID*	Pressure Head Comparison (w/ project - w/o project)	$0.1 \le$ Diff ≤ 0.5 % Occurrences	$0.5 \le$ Diff ≤ 1.0 % Occurrences	$1.0 \le$ Diff ≤ 2.0 % Occurrences	Diff ≥ 2.0 % Occurrences	MA Diff (ft)	RMS Diff (ft)	Max Diff (ft)
1	Run65 - Run17	21.172%	3.231%	0.348%	0.089%	0.0929	0.2064	3.91
2	Run66 - Run18	5.833%	0.192%	0.001%	0.001%	0.0260	0.0618	2.04
3	Run67 - Run19	19.191%	3.531%	0.339%	0.093%	0.0955	0.2111	3.57
4	Run68 - Run20	6.097%	0.383%	0.008%	0.000%	0.0309	0.0731	1.37
5	Run69 - Run21	29.010%	13.102%	5.620%	0.847%	0.2777	0.5192	8.83
6	Run70 - Run22	19.127%	3.190%	0.611%	0.021%	0.0880	0.1936	3.79
7	Run71 - Run23	35.369%	13.374%	4.667%	0.392%	0.2664	0.4665	8.47
8	Run72 - Run24	19.724%	2.617%	0.458%	0.077%	0.0881	0.3016	118.28**

* The K values used for Materials L2-1, L3A, and L3B-2 are (high, high, high), (high, low, high), (low, high, high), (low, low, high), (high, high, low), (high, low, low), (low, high, low), and (low, low, low) for comparisons 1 through 8. The high and low K values for Materials L2-1, L3A, and L3B-2 are as follows.

The low and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03) and (1, 1, 0.3) ft/d

The low and high values of hydraulic conductivity for Material L3A are (100, 100, 8) and (600, 600, 48) ft/d

The low and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1) and (100, 100, 100) ft/d

** This head difference occurred because of negative pressure heads developing in the unsaturated zone above the pumping well due to large and prolonged groundwater pumping associated with the maximum pumping, steady-state modeling condition.

Table F4. Eight pressure head comparisons between "with project" and "without project" runs with medium net recharge and head boundary conditions and low pumping in Stage 2 analysis (i.e., eight comparisons in Set D).

ID*	Pressure Head Comparison (w/ project - w/o project)	0.1 ≤ Diff ≤ 0.5 % Occurrences	0.5 ≤ Diff ≤ 1.0 % Occurrences	1.0 ≤ Diff ≤ 2.0 % Occurrences	Diff ≥ 2.0 % Occurrences	MA Diff (ft)	RMS Diff (ft)	Max Diff (ft)
1	Run73 - Run25	10.801%	0.853%	0.000%	0.000%	0.0418	0.0974	1.00
2	Run74 - Run26	2.014%	0.012%	0.000%	0.000%	0.0109	0.0301	0.64
3	Run75 - Run27	7.796%	0.773%	0.005%	0.000%	0.0379	0.0922	1.22
4	Run76 - Run28	1.947%	0.113%	0.000%	0.000%	0.0126	0.0403	1.00
5	Run77 - Run29	22.136%	7.293%	3.219%	0.197%	0.1646	0.3475	2.45
6	Run78 - Run30	11.628%	1.326%	0.149%	0.000%	0.0488	0.1258	1.44
7	Run79 - Run31	26.623%	6.084%	0.565%	0.000%	0.1261	0.2381	1.87
8	Run80 - Run32	10.512%	0.519%	0.013%	0.000%	0.0369	0.0886	1.22

* The K values used for Materials L2-1, L3A, and L3B-2 are (high, high, high), (high, low, high), (low, high, high), (low, low, high), (high, high, low), (high, low, low), (low, high, low), and (low, low, low) for comparisons 1 through 8. The high and low K values for Materials L2-1, L3A, and L3B-2 are as follows.

The low and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03) and (1, 1, 0.3) ft/d

The low and high values of hydraulic conductivity for Material L3A are (100, 100, 8) and (600, 600, 48) ft/d

The low and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1) and (100, 100, 100) ft/d

Table F5. Eight pressure head comparisons between "with project" and "without project" runs with low net recharge and head boundary conditions and high pumping in Stage 2 analysis (i.e., eight comparisons in Set E).

ID*	Pressure Head Comparison (w/ project - w/o project)	0.1 ≤ Diff ≤ 0.5 % Occurrences	0.5 ≤ Diff ≤ 1.0 % Occurrences	1.0 ≤ Diff ≤ 2.0 % Occurrences	Diff ≥ 2.0 % Occurrences	MA Diff (ft)	RMS Diff (ft)	Max Diff (ft)
1	Run81 - Run33	16.248%	0.394%	0.117%	0.000%	0.0474	0.1037	1.27
2	Run82 - Run34	2.077%	0.007%	0.000%	0.000%	0.0109	0.0308	0.79
3	Run83 - Run35	16.485%	0.398%	0.110%	0.000%	0.0492	0.1043	2.19
4	Run84 - Run36	2.399%	0.016%	0.000%	0.000%	0.0120	0.0336	2.77
5	Run85 - Run37	28.672%	2.431%	0.549%	0.081%	0.1042	0.2051	3.37
6	Run86 - Run38	4.328%	0.403%	0.073%	0.001%	0.0260	0.0787	8.23
7	Run87 - Run39	32.955%	2.406%	0.638%	0.026%	0.1153	0.2112	4.20
8	Run88 - Run40	5.390%	0.606%	0.100%	0.001%	0.0306	0.0878	3.89

* The K values used for Materials L2-1, L3A, and L3B-2 are (high, high, high), (high, low, high), (low, high, high), (low, low, high), (high, high, low), (high, low, low), (low, high, low), and (low, low, low) for comparisons 1 through 8. The high and low K values for Materials L2-1, L3A, and L3B-2 are as follows.

The low and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03) and (1, 1, 0.3) ft/d

The low and high values of hydraulic conductivity for Material L3A are (100, 100, 8) and (600, 600, 48) ft/d

The low and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1) and (100, 100, 100) ft/d

Table F6. Eight pressure head comparisons between "with project" and "without project" runs with low net recharge and head boundary conditions and low pumping in Stage 2 analysis (i.e., eight comparisons in Set F).

ID*	Pressure Head Comparison (w/ project - w/o project)	0.1 ≤ Diff ≤ 0.5 % Occurrences	0.5 ≤ Diff ≤ 1.0 % Occurrences	1.0 ≤ Diff ≤ 2.0 % Occurrences	Diff ≥ 2.0 % Occurrences	MA Diff (ft)	RMS Diff (ft)	Max Diff (ft)
1	Run89 - Run41	0.598%	0.000%	0.000%	0.000%	0.0061	0.0163	0.22
2	Run90 - Run42	0.003%	0.000%	0.000%	0.000%	0.0012	0.0040	0.23
3	Run91 - Run43	0.703%	0.000%	0.000%	0.000%	0.0064	0.0177	0.32
4	Run92 - Run44	0.010%	0.000%	0.000%	0.000%	0.0012	0.0044	0.24
5	Run93 - Run45	4.284%	0.000%	0.000%	0.000%	0.0174	0.0392	0.39
6	Run94 - Run46	0.043%	0.000%	0.000%	0.000%	0.0033	0.0094	0.21
7	Run95 - Run47	2.768%	0.000%	0.000%	0.000%	0.0152	0.0346	0.44
8	Run96 - Run48	0.023%	0.000%	0.000%	0.000%	0.0026	0.0072	0.25

* The K values used for Materials L2-1, L3A, and L3B-2 are (high, high, high), (high, low, high), (low, high, high), (low, low, high), (high, high, low), (high, low, low), (low, high, low), and (low, low, low) for comparisons 1 through 8. The high and low K values for Materials L2-1, L3A, and L3B-2 are as follows.

The low and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03) and (1, 1, 0.3) ft/d

The low and high values of hydraulic conductivity for Material L3A are (100, 100, 8) and (600, 600, 48) ft/d

The low and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1) and (100, 100, 100) ft/d

Appendix G. Information Needed for the HHD EA Report

The information provided in the appendix is prepared based on the requests of SAJ at the HHD Phase 1A model project meeting on October 30, 2007 in Jacksonville, FL. The following requests were made at the meeting.

1. ERDC adds text to the modeling report that describes the QA/QC procedures that were used during model development and analysis.
2. ERDC determines if the run logs from sensitivity simulations are still available. If so, ERDC will quantify the additional wells that went "dry" during the "with project" simulations. ERDC will also identify the location of these additional "dry" wells.
3. ERDC measures the minimum and maximum distance from the HHD to various computed head differential values. The simulations that will be measured are those contained in Tables F3 and F5. The head difference intervals to be measured will be the same intervals shown in the Appendix F plots. This minimum and maximum distance will be measured by using the arc feature in GMS 6.0 for Reaches 1A, 1B, 1C, 1D, 2, and 3.
4. ERDC updates the head difference plots (simulations in Tables F3 and F5) to show the location of the pumping wells that were incorporated into the model.
5. ERDC prepares a project summary for the EA report. The summary should provide the information needed below.

    a. Conclusion of the results shown by the difference maps for (1) the low net recharge and low head boundary condition with high pumping and (2) the medium net recharge and head boundary condition with high pumping.

    b. Summary information on where the “k” values were derived from (i.e., list which models or historical information).

    c. Were the medium “k” values utilized for the other eight layers the average “k” as listed in the attachment Table 4-1?

    d. What is the minimum net recharge amount assumed in the model?

All the requested information, except for the QA/QC procedures (i.e., for Request 1), is provided in this appendix. The QA/QC procedures for Request 1 can be found in Sections 3.12, 4.7, and 5.3 for data compilation, model construction, and simulation results and post-processed data, respectively. The summary for the EA report for Request 5 is given in Section G.1, the dry well information for Request 2 is given in Section G.2, the information of the minimum and maximum distances of the cutoff wall impact on pressure head for Request 3 is provided in Section G.3, and the updated head difference plots for Request 4 are included in Section G.4.

HHD Phase 1A groundwater modeling project summary for the EA report (i.e., for Request 5).

Based on the head difference tables provided in Section G.3 (Tables G24 through G35), the following summary can be drawn from the computational results.

The ranges of hydraulic conductivity (i.e., K) shown in Tables 1 through 3 in the main text for the 11 materials considered in the HHD Phase 1A model were determined based on the available data provided by SAJ. For the reader's convenience, Tables 1 through 3 are repeated here as Tables G3 through G5. The reports referenced in each table (the last column, high-lighted with blue box in Tables G3 through G5) identifies the sources of data used to determine the horizontal and vertical hydraulic conductivities of each material.

Throughout the 96 model runs considered in Stage 2 for the cutoff wall impact analysis, the medium values of hydraulic conductivity were utilized for the layers other than L2-1, L3A, and L3B-2.

The net recharge rates among 0.0, 0.5 and 5.0 inches per year were used as low, medium, and high values, respectively, for the entire model domain. These values were adopted based on the findings from the previous studies in the EAA as described in Section 3.9.

Pumping wells going dry in model runs considered in Tables F3 and F5 (i.e., for Request 2).

Requests 2 through 4 are associated with models runs considered in Tables F3 (i.e., with medium net recharge and head boundary conditions and high pumping) and F5 (i.e., with low net recharge and head boundary

conditions and high pumping) in Stage 2 analysis. For convenience, these two tables are given again in this appendix G for the reader's reference. Table G6 is identical to Table F3, and Table G7 is Table F5.

Table G8 lists the 49 pumping wells that went dry as shown in the computational result of Run 17 (w/o project). The last row of Table G8 shows the pumping well that went dry due to the presence of the cutoff wall, which results from the comparison of the results between Runs 17 and Run 65 (w/ project). In the same format, Tables G9 through G15 shows the dry pumping well information for the other seven pairs of comparison included in Table G6 (i.e., Table F3), and Tables G16 through G23 provide the dry pumping well data for the eight pairs of comparison in Table G7 (i.e., Table F5). For the Phase I model simulations, each pumping well was assumed to be capable of extracting groundwater at a specified rate. However, in several instances the pumping rate specified in the model exceeded the aquifer's potential to supply groundwater that this rate on a long term, steady-state basis. In these instances the model simulation was allowed to proceed and a zone of negative pressure developed around these "dry" wells. This area of negative pressure represents an unsaturated zone surrounding the wells screen. In many cases, this zone of negative pressure was relatively small. This small zone of negative pressure tends to indicate that the permitted rate used in the model to simulate high pumping conditions may or may not be achievable on a long term basis. Adjustments to the hydro-geologic properties in the model, such as would be required for calibration, or reducing pumping to reflect actual groundwater withdraws may result in simulations where these wells do not "dry" out. In other cases, large zones of negative pressure head were generated. This indicates that the aquifer's potential to supply these wells will be exceeded if these wells or well fields are continuously pumped at the permitted rates on a long term, steady state basis. The majority of the wells that have these large negative pressure head values (last column of Tables G8 through G23) are part of well fields. In practice these well fields may not pump all of the wells in the field at the maximum rate for an extended period of time. Cycling of individual wells or between the various wells within a field will minimize the cone of depression generated by these wells. For this phase of the project, however, the pumping capacity (i.e., the maximum pumping rate) was used as the high pumping rate and a steady-state condition was considered. These assumptions were made to meet the goal of this project which was to provide an order-or-magnitude cutoff wall impact estimate. The results

provided in Appendix G, as well as in the other sections of this report, must not be used for comparison and/or interpretation in an absolute sense.

As shown in these tables, there is no difference of dry pumping well in 14 of the 16 comparisons. While the presence of the cutoff wall added one more dry well in the comparison of “Run65 – Run17” and two more dry wells in the comparison of “Run69 – Run21”, the negative pressure head computed at these three dry wells were so small (i.e., close to zero) and can be considered insignificant. Therefore, it appears that the installation of the proposed cutoff wall does not result in a significant increase of the number of pumping wells that will have inadequate water to supply to meet their allocation limit under both the medium and the low net recharge and head boundary conditions.

The minimum and maximum distances associated head differential values of 0.1, 0.5, 1.0, and 2.0 ft (i.e., for Request 3).

Tables G24 through G29 list the minimum and maximum distances from the HHD to various computed head differential values at 0.1, 0.5, 1.0, and 2.0 ft for model run pairs compared in Table F3 (i.e., Table G6, when the medium net recharge and head boundary conditions and the high pumping were considered), and Tables G30 through G35 for model run pairs compared in Table F5 (i.e., Table G7, when the low net recharge and head boundary conditions and the high pumping were considered). The distances were measured with the arc feature in the map module of GMS 6.0 for Reaches 1A, 1B, 1C, 1D, 2, and 3 (Figure G1). Figure G2 shows how these maximum and minimum distances were measured for the comparison of “Run71 – Run23” in Reach 1A (Table G24). It is noted that some entries in the “Distance Max” columns in these tables have two values included (These entries have the numbers highlighted in red and blue colors). The first number (highlighted in red) represents the maximum distance measured near pumping wells, while the second number (highlighted in blue) is the maximum distance measured mainly due to the cutoff wall effect.

If we only account for the second number (i.e., highlighted in blue) when there are two values appearing in the “Distance Max” columns, the maximum distances associated with the head differential values of 0.1, 0.5, 1.0, and 2.0 ft were (34,500 ft, 11,500 ft, 4,800 ft, 600 ft) for Reach 1A, (11,500 ft, 1,900 ft, 400 ft, 0 ft) for Reach 1B, (30,000 ft, 9,200 ft, 900 ft, 0 ft) for Reach 1C, (49,000 ft, 21,500 ft, 7,000 ft, 650 ft) for Reach 1D, (36,000 ft, 15,000 ft, 5,800 ft, 800 ft) for Reach 2, and (42,000 ft, 17,800 ft,

5,400 ft, 800 ft) for Reach 3 when the medium net recharge and head boundary conditions with high pumping was considered (i.e., comparisons in Table G or Table F3). The maximum distances were (31,100 ft, 9,500 ft, 3,500 ft, 0 ft) for Reach 1A, (4,300 ft, 0 ft, 0 ft, 0 ft) for Reach 1B, (13,600 ft, 800 ft, 0 ft, 0 ft) for Reach 1C, (21,500 ft, 100 ft, 0 ft, 0 ft) for Reach 1D, (32,600 ft, 4,800 ft, 500 ft, 0 ft) for Reach 2, and (16,000 ft, 50 ft, 0 ft, 0 ft) for Reach 3 when the low net recharge and head boundary conditions with high pumping was considered (i.e., comparisons in Table G7 or Table F5). Tables G1 and G2 present these maximum distances in a tabular format in Section G.1. For the reader's convenience, the maximum distances shown in Tables G1 and G2 are highlighted with light blue shades in Tables G24 through G35.

Table G1. Approximate maximum distances of cutoff wall impact when the medium net recharge and head boundary conditions with high pumping was considered (associated with Table F3).

Reach ID	Maximum distance of cutoff wall impact, ft			
	Head difference ≥ 0.1 ft	Head difference ≥ 0.5 ft	Head difference ≥ 1 ft	Head difference ≥ 2 ft
1A	34,500	11,500	4,800	600
1B	11,500	1,900	400	0
1C	30,000	9,200	900	0
1D	49,000	21,500	7,000	650
2	36,000	15,000	5,800	800
3	42,000	17,800	5,400	800

Table G2. Approximate maximum distances of cutoff wall impact when the low net recharge and head boundary conditions with high pumping was considered (associated with Table F5).

Reach ID	Maximum distance of cutoff wall impact, ft			
	Head difference ≥ 0.1 ft	Head difference ≥ 0.5 ft	Head difference ≥ 1 ft	Head difference ≥ 2 ft
1A	31,100	9,500	3,500	0
1B	4,300	0	0	0
1C	13,600	800	0	0
1D	21,500	100	0	0
2	32,600	4,800	500	0
3	16,000	50	0	0

Table G3. Summary of available hydraulic conductivity data for Materials L1, L2-1, and L2-1 in the HHD Phase 1A model.

Layer 1 - Undiferentiated Sands/Embankment Fill			High			Low			Expected			
Location	Reach	Material	Kh (ft/day)	K ratio (Kv/Kh)	Kv (ft/day)	Kh (ft/day)	K ratio (Kv/Kh)	Kv (ft/day)	Kh (ft/day)	K ratio (Kv/Kh)	Kv (ft/day	Reference
Line 6	1	sand	4.680	1.000	4.680	0.886	1.000	0.886	2.030	1.000	2.030	Reach 1 MRR(NOV00), Page H8-12
STA 3866+00	2	fill	N/A	N/A	N/A	N/A	N/A	N/A	2.800	1.000	2.800	Reach 2/3 MRR(DEC06), Plate G-9
STA 3826+00	2	fill	N/A	N/A	N/A	N/A	N/A	N/A	2.800	1.000	2.800	Reach 2/3 MRR(DEC06), Plate G-11
STA 3726+00	2	fill	N/A	N/A	N/A	N/A	N/A	N/A	2.800	1.000	2.800	Reach 2/3 MRR(DEC06), Plate G-15
STA 3606+00	2	fill	N/A	N/A	N/A	N/A	N/A	N/A	2.800	1.000	2.800	Reach 2/3 MRR(DEC06), Plate G-18
STA 3188+00	2	fill	N/A	N/A	N/A	N/A	N/A	N/A	2.800	1.000	2.800	Reach 2/3 MRR(DEC06), Plate G-21
STA 3127+00	2	fill	N/A	N/A	N/A	N/A	N/A	N/A	2.800	1.000	2.800	Reach 2/3 MRR(DEC06), Plate G-24
STA 3016+00	2	fill	N/A	N/A	N/A	N/A	N/A	N/A	2.800	1.000	2.800	Reach 2/3 MRR(DEC06), Plate G-27
STA 2819+00	3	fill	N/A	N/A	N/A	N/A	N/A	N/A	2.850	1.000	2.850	Reach 2/3 MRR(DEC06), Plate G-32
STA 2723+00	3	fill	N/A	N/A	N/A	N/A	N/A	N/A	2.900	1.000	2.900	Reach 2/3 MRR(DEC06), Plate G-35
	REMER	undiferentiated	No specific value provided but noted as "generally low conductivity"									REMER Framework (DEC05), Page 9
Selected Range for HHD Model			5.0	1.0	5.0	0.5	1.0	0.5	2.8	1.0	2.8	

Layer 2 - Peats, Clays, Silts, Sands			High			Low			Expected			
Location	Reach	Material	Kh (ft/day)	K ratio (Kv/Kh)	Kv (ft/day)	Kh (ft/day)	K ratio (Kv/Kh)	Kv (ft/day)	Kh (ft/day)	K ratio (Kv/Kh)	Kv (ft/day	Reference
Line 6	1	peat	0.449	0.305	0.137	0.118	0.272	0.032	0.230	0.288	0.066	Reach 1 MRR(NOV00), Page H8-12
Line 6	1	silt/clay	0.327	0.797	0.261	0.102	0.394	0.040	0.183	0.560	0.102	Reach 1 MRR(NOV00), Page H8-12
STA 3866+00	2	silt/clay	N/A	N/A	N/A	N/A	N/A	N/A	0.22	0.73	0.161	Reach 2/3 MRR(DEC06), Plate G-9
STA 3826+00	2	peat	N/A	N/A	N/A	N/A	N/A	N/A	0.29	0.3	0.087	Reach 2/3 MRR(DEC06), Plate G-11
STA 3726+00	2	peat/silt/clay	N/A	N/A	N/A	N/A	N/A	N/A	Not present above limestone			Reach 2/3 MRR(DEC06), Plate G-15
STA 3606+00	2	peat/silt/clay	N/A	N/A	N/A	N/A	N/A	N/A	Not present above limestone			Reach 2/3 MRR(DEC06), Plate G-18
STA 3188+00	2	peat	N/A	N/A	N/A	N/A	N/A	N/A	0.29	0.3	0.087	Reach 2/3 MRR(DEC06), Plate G-21
STA 3188+00	2	clay	N/A	N/A	N/A	N/A	N/A	N/A	0.22	0.73	0.161	Reach 2/3 MRR(DEC06), Plate G-21
STA 3127+00	2	peat	N/A	N/A	N/A	N/A	N/A	N/A	0.29	0.3	0.087	Reach 2/3 MRR(DEC06), Plate G-24
STA 3016+00	2	peat	N/A	N/A	N/A	N/A	N/A	N/A	0.29	0.3	0.087	Reach 2/3 MRR(DEC06), Plate G-27
STA 2819+00	3	peat	N/A	N/A	N/A	N/A	N/A	N/A	0.29	0.3	0.087	Reach 2/3 MRR(DEC06), Plate G-32
STA 2723+00	3	peat	N/A	N/A	N/A	N/A	N/A	N/A	0.29	0.3	0.087	Reach 2/3 MRR(DEC06), Plate G-35
STA 2723+00	3	clay	N/A	N/A	N/A	N/A	N/A	N/A	0.22	0.73	0.161	Reach 2/3 MRR(DEC06), Plate G-35
STA 3866+00	2	shallow sand	N/A	N/A	N/A	N/A	N/A	N/A	10	1	10.000	Reach 2/3 MRR(DEC06), Plate G-9
STA 3826+00	2	shallow sand	N/A	N/A	N/A	N/A	N/A	N/A	10	1	10.000	Reach 2/3 MRR(DEC06), Plate G-11
STA 3726+00	2	shallow sand	N/A	N/A	N/A	N/A	N/A	N/A	10	1	10.000	Reach 2/3 MRR(DEC06), Plate G-15
STA 3606+00	2	shallow sand	N/A	N/A	N/A	N/A	N/A	N/A	10	1	10.000	Reach 2/3 MRR(DEC06), Plate G-18
STA 3188+00	2	shallow sand	N/A	N/A	N/A	N/A	N/A	N/A	Not present above limestone			Reach 2/3 MRR(DEC06), Plate G-21
STA 3127+00	2	shallow sand	N/A	N/A	N/A	N/A	N/A	N/A	Not present above limestone			Reach 2/3 MRR(DEC06), Plate G-24
STA 3016+00	2	shallow sand	N/A	N/A	N/A	N/A	N/A	N/A	Not present above limestone			Reach 2/3 MRR(DEC06), Plate G-27
STA 2819+00	3	shallow sand	N/A	N/A	N/A	N/A	N/A	N/A	10	1	10.000	Reach 2/3 MRR(DEC06), Plate G-32
STA 2723+00	3	shallow sand	N/A	N/A	N/A	N/A	N/A	N/A	10	1	10.000	Reach 2/3 MRR(DEC06), Plate G-35
West	REMER	shallow sand	N/A	N/A	N/A	N/A	N/A	N/A	93	N/A	N/A	REMER Framework (DEC05), database
East	REMER	peat/shallow sand	N/A	N/A	N/A	N/A	N/A	N/A	13	N/A	N/A	REMER Framework (DEC05), database
Selected Range for HHD Model (L2-1)			1.0	0.3	0.3	0.1	0.3	0.03	0.3	0.3	0.1	
Selected Range for HHD Model (L2-2)			100.0	1.0	100.0	1.0	1.0	1.0	10.0	1.0	10.0	

Table G4. Summary of available hydraulic conductivity data for Materials L3A, L3B-1, and L3B-2 in the HHD Phase 1A model.

Layer 3A - Limestone

Location	Reach	Material	High Kh (ft/day)	High K ratio (Kv/Kh)	High Kv (ft/day)	Low Kh (ft/day)	Low K ratio (Kv/Kh)	Low Kv (ft/day)	Expected Kh (ft/day)	Expected K ratio (Kv/Kh)	Expected Kv (ft/day)	Reference
Line 6	1	rock	584.64	0.080	4.68E+01	110.736	0.080	8.856	254.88	0.080	20.304	Reach 1 MRR(NOV00), Page H8-12
various borings	1	limestone	210	N/A	N/A	1.44	N/A	N/A	N/A	N/A	N/A	Reach 1 MRR(NOV00), Page H4-13,14
STA 3866+00	2	sandy shell	N/A	N/A	N/A	N/A	N/A	N/A	600	1	600.000	Reach 2/3 MRR(DEC06), Plate G-9
STA 3866+00	2	limestone	N/A	N/A	N/A	N/A	N/A	N/A	360	0.08	28.800	Reach 2/3 MRR(DEC06), Plate G-9
STA 3826+00	2	sandy shell	N/A	N/A	N/A	N/A	N/A	N/A	600	1	600.000	Reach 2/3 MRR(DEC06), Plate G-11
STA 3726+00	2	limestone	N/A	N/A	N/A	N/A	N/A	N/A	360	0.08	28.800	Reach 2/3 MRR(DEC06), Plate G-15
STA 3726+00	2	sandy shell	N/A	N/A	N/A	N/A	N/A	N/A	605	1	605.000	Reach 2/3 MRR(DEC06), Plate G-15
STA 3606+00	2	limestone	N/A	N/A	N/A	N/A	N/A	N/A	360	0.08	28.800	Reach 2/3 MRR(DEC06), Plate G-18
STA 3188+00	2	limestone	N/A	N/A	N/A	N/A	N/A	N/A	360	0.08	28.800	Reach 2/3 MRR(DEC06), Plate G-21
STA 3127+00	2	limestone	N/A	N/A	N/A	N/A	N/A	N/A	360	0.08	28.800	Reach 2/3 MRR(DEC06), Plate G-24
STA 3016+00	2	limestone	N/A	N/A	N/A	N/A	N/A	N/A	360	0.08	28.800	Reach 2/3 MRR(DEC06), Plate G-27
STA 2819+00	3	limestone	N/A	N/A	N/A	N/A	N/A	N/A	360	0.08	28.800	Reach 2/3 MRR(DEC06), Plate G-32
STA 2723+00	3	limestone	N/A	N/A	N/A	N/A	N/A	N/A	360	0.08	28.800	Reach 2/3 MRR(DEC06), Plate G-35
EAA Model (COE)		caprock	N/A	N/A	N/A	N/A	N/A	N/A	100	0.1	10	Email from Samir Itani (9JUN05)
EAA Model (SEEP w/calib)		caprock	N/A	N/A	N/A	N/A	N/A	N/A	400	0.0025	1	Email from Samir Itani (9JUN05)
EAA Model (MODFLOW)		caprock	N/A	N/A	N/A	N/A	N/A	N/A	500	0.0022	1.1	Email from Samir Itani (9JUN05)
Selected Range for HHD Model			600.0	0.08	48.0	100.0	0.08	8.0	400.0	0.08	32.0	

Layer 3B - Sands

Location	Reach	Material	High Kh (ft/day)	High K ratio (Kv/Kh)	High Kv (ft/day)	Low Kh (ft/day)	Low K ratio (Kv/Kh)	Low Kv (ft/day)	Expected Kh (ft/day)	Expected K ratio (Kv/Kh)	Expected Kv (ft/day)	Reference
Line 6	1	sand	4.680	1.000	4.680	0.886	1.000	0.886	2.030	1.000	2.030	Reach 1 MRR(NOV00), Page H8-12
STA 3866+00	2	sand	N/A	N/A	N/A	N/A	N/A	N/A	10	1	10.000	Reach 2/3 MRR(DEC06), Plate G-9
STA 3826+00	2	sand	N/A	N/A	N/A	N/A	N/A	N/A	10	1	10.000	Reach 2/3 MRR(DEC06), Plate G-11
STA 3826+00	2	clay	N/A	N/A	N/A	N/A	N/A	N/A	0.22	0.73	0.161	Reach 2/3 MRR(DEC06), Plate G-11
STA 3726+00	2	sand	N/A	N/A	N/A	N/A	N/A	N/A	10	1	10.000	Reach 2/3 MRR(DEC06), Plate G-15
STA 3726+00	2	clay	N/A	N/A	N/A	N/A	N/A	N/A	0.22	0.73	0.161	Reach 2/3 MRR(DEC06), Plate G-15
STA 3606+00	2	sand	N/A	N/A	N/A	N/A	N/A	N/A	10	1	10.000	Reach 2/3 MRR(DEC06), Plate G-18
STA 3188+00	2	sand	N/A	N/A	N/A	N/A	N/A	N/A	10	1	10.000	Reach 2/3 MRR(DEC06), Plate G-21
STA 3127+00	2	sand	N/A	N/A	N/A	N/A	N/A	N/A	10	1	10.000	Reach 2/3 MRR(DEC06), Plate G-24
STA 3016+00	2	sand	N/A	N/A	N/A	N/A	N/A	N/A	10	1	10.000	Reach 2/3 MRR(DEC06), Plate G-27
STA 2819+00	3	sand	N/A	N/A	N/A	N/A	N/A	N/A	10	1	10.000	Reach 2/3 MRR(DEC06), Plate G-32
STA 2723+00	3	sand	N/A	N/A	N/A	N/A	N/A	N/A	10	1	10.000	Reach 2/3 MRR(DEC06), Plate G-35
East	REMER	sand	73	N/A	N/A	14	N/A	N/A	N/A	N/A	N/A	REMER Framework (DEC05), database
EAA Model (COE)		Ft. Thompson	N/A	N/A	N/A	N/A	N/A	N/A	60	0.417	25	Email from Samir Itani (9JUN05)
EAA Model (SEEP w/calib)		Ft. Thompson	N/A	N/A	N/A	N/A	N/A	N/A	1000	0.004	4	Email from Samir Itani (9JUN05)
EAA Model (MODFLOW)		Ft. Thompson	N/A	N/A	N/A	N/A	N/A	N/A	400	0.025	10	Email from Samir Itani (9JUN05)
Selected Range for HHD Model (L3B-1)			5.0	0.8	4.0	0.5	0.8	0.4	1.0	0.8	0.8	
Selected Range for HHD Model (L3B-2)			100.0	1.0	100.0	1.0	1.0	1.0	10.0	1.0	10.0	

Table G5. Summary of available hydraulic conductivity data for Materials L4, L5, L6, L7-1, and L7-2 in the HHD Phase 1A model.

Layer 4 - Sands

Location	Reach	Material	High Kh (ft/day)	High K ratio (Kv/Kh)	High Kv (ft/day)	Low Kh (ft/day)	Low K ratio (Kv/Kh)	Low Kv (ft/day)	Expected Kh (ft/day)	Expected K ratio (Kv/Kh)	Expected Kv (ft/day)	Reference
Line 6	1	sand	4.680	1.000	4.680	0.886	1.000	0.886	2.030	1.000	2.030	Reach 1 MRR(NOV00), Page H8-12
All Stations	2/3	sand	N/A	N/A	N/A	N/A	N/A	N/A	10	1	10.000	Reach 2/3 MRR(DEC06), Plate G-9 to 35
East	REMER	sand	37	N/A	N/A	15	N/A	N/A	N/A	N/A	N/A	REMER Framework (DEC05), database
Selected Range for HHD Model			30.0	0.1	3.0	5.0	0.1	0.5	10.0	0.1	1.0	

Layer 5 - Limestone

Location	Reach	Material	High Kh (ft/day)	High K ratio (Kv/Kh)	High Kv (ft/day)	Low Kh (ft/day)	Low K ratio (Kv/Kh)	Low Kv (ft/day)	Expected Kh (ft/day)	Expected K ratio (Kv/Kh)	Expected Kv (ft/day)	Reference
Line 6	1	sand	4.680	1.000	4.680	0.886	1.000	0.886	2.030	1.000	2.030	Reach 1 MRR(NOV00), Page H8-12
All Stations	2/3	sand	N/A	N/A	N/A	N/A	N/A	N/A	10	1	10.000	Reach 2/3 MRR(DEC06), Plate G-9 to 35
Southwest	REMER	limestone	730	N/A	N/A	151	N/A	N/A	N/A	N/A	N/A	REMER Framework (DEC05), database
Selected Range for HHD Model			750.0	0.08	60.0	150.0	0.08	12.0	400.0	0.08	32.0	

Layer 6 - Sands

Location	Reach	Material	High Kh (ft/day)	High K ratio (Kv/Kh)	High Kv (ft/day)	Low Kh (ft/day)	Low K ratio (Kv/Kh)	Low Kv (ft/day)	Expected Kh (ft/day)	Expected K ratio (Kv/Kh)	Expected Kv (ft/day)	Reference
Line 6	1	sand	4.680	1.000	4.680	0.886	1.000	0.886	2.030	1.000	2.030	Reach 1 MRR(NOV00), Page H8-12
All Stations	2/3	sand	N/A	N/A	N/A	N/A	N/A	N/A	10	1	10.000	Reach 2/3 MRR(DEC06), Plate G-9 to 35
South	REMER	sand	33	N/A	N/A	0.01	N/A	N/A	N/A	N/A	N/A	REMER Framework (DEC05), database
EAA Model (COE)		Tamiami	N/A	N/A	N/A	N/A	N/A	N/A	36.000	0.500	18.000	Email from Samir Itani (9JUN05)
EAA Model (SEEP w/calib)		Tamiami	N/A	N/A	N/A	N/A	N/A	N/A	300	0.003	1.000	Email from Samir Itani (9JUN05)
EAA Model (MODFLOW)		Tamiami	N/A	N/A	N/A	N/A	N/A	N/A	36.000	0.500	18.000	Email from Samir Itani (9JUN05)
Selected Range for HHD Model			35.0	0.5	17.5	10.0	0.5	5.0	35.0	0.5	17.5	

Layer 7 - Hawthorn Group/Sand Stone Aquifer

Location	Reach	Material	High Kh (ft/day)	High K ratio (Kv/Kh)	High Kv (ft/day)	Low Kh (ft/day)	Low K ratio (Kv/Kh)	Low Kv (ft/day)	Expected Kh (ft/day)	Expected K ratio (Kv/Kh)	Expected Kv (ft/day)	Reference
East	REMER	Sand Stone Aq.	1375	N/A	N/A	200	N/A	N/A	N/A	N/A	N/A	REMER Framework (DEC05), database
Selected Range for HHD Model (L7-1)			1375.0	0.1	137.5	200.0	0.1	20.0	500.0	0.1	50.0	
Selected Range for HHD Model (L7-2)			1.0	0.3	0.3	0.1	0.3	0.03	0.3	0.3	0.09	Assumed values similar to Clay in Layer 2

Table G6. Eight pressure head comparisons between "with project" and "without project" runs with medium net recharge and head boundary conditions and high pumping in Stage 2 analysis (i.e., eight comparisons in Set C).

ID*	Pressure Head Comparison (w/ project - w/o project)	0.1 ≤ Diff ≤ 0.5 % Occurrences	0.5 ≤ Diff ≤ 1.0 % Occurrences	1.0 ≤ Diff ≤ 2.0 % Occurrences	Diff ≥ 2.0 % Occurrences	MA Diff (ft)	RMS Diff (ft)	Max Diff (ft)
1	Run65 - Run17	21.172%	3.231%	0.348%	0.089%	0.0929	0.2064	3.91
2	Run66 - Run18	5.833%	0.192%	0.001%	0.001%	0.0260	0.0618	2.04
3	Run67 - Run19	19.191%	3.531%	0.339%	0.093%	0.0955	0.2111	3.57
4	Run68 - Run20	6.097%	0.383%	0.008%	0.000%	0.0309	0.0731	1.37
5	Run69 - Run21	29.010%	13.102%	5.620%	0.847%	0.2777	0.5192	8.83
6	Run70 - Run22	19.127%	3.190%	0.611%	0.021%	0.0880	0.1936	3.79
7	Run71 - Run23	35.369%	13.374%	4.667%	0.392%	0.2664	0.4665	8.47
8	Run72 - Run24	19.724%	2.617%	0.458%	0.077%	0.0881	0.3016	118.28**

* The K values used for Materials L2-1, L3A, and L3B-2 are (high, high, high), (high, low, high), (low, high, high), (low, low, high), (high, high, low), (high, low, low), (low, high, low), and (low, low, low) for comparisons 1 through 8. The medium K values were used for the other eight materials. The high and low K values for Materials L2-1, L3A, and L3B-2 are as follows.

The low and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03) and (1, 1, 0.3) ft/d

The low and high values of hydraulic conductivity for Material L3A are (100, 100, 8) and (600, 600, 48) ft/d

The low and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1) and (100, 100, 100) ft/d

** This head difference occurred in an unsaturated zone caused due to large groundwater pumping.

Table G7. Eight pressure head comparisons between "with project" and "without project" runs with low net recharge and head boundary conditions and high pumping in Stage 2 analysis (i.e., eight comparisons in Set E).

ID*	Pressure Head Comparison (w/ project - w/o project)	0.1 ≤ Diff ≤ 0.5 % Occurrences	0.5 ≤ Diff ≤ 1.0 % Occurrences	1.0 ≤ Diff ≤ 2.0 % Occurrences	Diff ≥ 2.0 % Occurrences	MA Diff (ft)	RMS Diff (ft)	Max Diff (ft)
1	Run81 - Run33	16.248%	0.394%	0.117%	0.000%	0.0474	0.1037	**1.27**
2	Run82 - Run34	2.077%	0.007%	0.000%	0.000%	0.0109	0.0308	**0.79**
3	Run83 - Run35	16.485%	0.398%	0.110%	0.000%	0.0492	0.1043	**2.19**
4	Run84 - Run36	2.399%	0.016%	0.000%	0.000%	0.0120	0.0336	**2.77**
5	Run85 - Run37	28.672%	2.431%	0.549%	0.081%	0.1042	0.2051	**3.37**
6	Run86 - Run38	4.328%	0.403%	0.073%	0.001%	0.0260	0.0787	**8.23**
7	Run87 - Run39	32.955%	2.406%	0.638%	0.026%	0.1153	0.2112	**4.20**
8	Run88 - Run40	5.390%	0.606%	0.100%	0.001%	0.0306	0.0878	**3.89**

* The K values used for Materials L2-1, L3A, and L3B-2 are (high, high, high), (high, low, high), (low, high, high), (low, low, high), (high, high, low), (high, low, low), (low, high, low), and (low, low, low) for comparisons 1 through 8. The medium K values were used for the other eight materials. The high and low K values for Materials L2-1, L3A, and L3B-2 are as follows.

The low and high values of hydraulic conductivity for Material L2-1 are (0.1, 0.1, 0.03) and (1, 1, 0.3) ft/d

The low and high values of hydraulic conductivity for Material L3A are (100, 100, 8) and (600, 600, 48) ft/d

The low and high values of hydraulic conductivity for Material L3B-2 are (1, 1, 1) and (100, 100, 100) ft/d

Table G8. List of the 49 nodal locations where dewatering occurred at pumping wells for Run 17 (w/o project) and Run 65 (w/ project).

Run 17 (w/o project) Dry Well Name	Florida East X-Coordinate	Florida East Y- Coordinate	Nodal Z-Coordinate	Pumping Max Rate, cfd	Computed Pressure Head, ft
Clewiston_Fld_AT_S-2_1	689144.0	872904.0	14.708	-15401.	-13.1532
Clewiston_Fld_AT_S-2_1	689144.0	872904.0	12.255	-15401.	-10.6511
Clewiston_Fld_AT_S-2_1	689144.0	872904.0	6.735	-15401.	-5.0861
DupuisReserve_5 (remove)	794677.0	969277.0	19.308	-1155.	-9.0673
DupuisReserve_5 (remove)	794677.0	969277.0	18.198	-1155.	-7.9336
DupuisReserve_5 (remove)	794677.0	969277.0	17.088	-1155.	-6.7838
DupuisReserve_3 (remove)	793111.0	968159.0	17.798	-1925.	-7.9432
DupuisReserve_3 (remove)	793111.0	968159.0	16.354	-1925.	-6.4659
DupuisReserve_4 (remove)	796413.0	969856.0	19.038	-1925.	-8.2097
DupuisReserve_4 (remove)	796413.0	969856.0	17.886	-1925.	-7.0347
DupuisReserve_5	793243.0	967580.0	18.922	-1925.	-10.7043
DupuisReserve_5	793243.0	967580.0	16.351	-1925.	-8.0465
DupuisReserve_5	793243.0	967580.0	10.623	-1925.	-0.6864
DupuisReserve_2	799833.0	970908.0	21.282	-3850.	-9.4367
DupuisReserve_2	799833.0	970908.0	19.490	-3850.	-7.6227
DupuisReserve_3	794927.0	969185.0	20.076	-3850.	-12.4353
DupuisReserve_3	794927.0	969185.0	18.629	-3850.	-10.9165
DupuisReserve_3	794927.0	969185.0	17.182	-3850.	-9.3966
DupuisReserve_3	794927.0	969185.0	10.942	-3850.	-0.9184
DupuisReserve_1	799478.0	971605.0	21.032	-6353.	-10.1854
DupuisReserve_1	799478.0	971605.0	19.421	-6353.	-8.5430
DupuisReserve_4	795045.0	969250.0	18.737	-6738.	-23.3482
DupuisReserve_4	795045.0	969250.0	17.240	-6738.	-20.9408
DupuisReserve_4	795045.0	969250.0	10.963	-6738.	-4.4984
DupuisReserve_8	793546.0	967422.0	19.214	-15401.	-133.0057
DupuisReserve_8	793546.0	967422.0	16.456	-15401.	-123.8610

Run 17 (w/o project) Dry Well Name	Florida East X-Coordinate	Florida East Y- Coordinate	Nodal Z-Coordinate	Pumping Max Rate, cfd	Computed Pressure Head, ft
DupuisReserve_8	793546.0	967422.0	10.651	-15401.	-18.3530
Farm	661437.0	878143.0	13.398	-144385.	-13.2975
Farm	661437.0	878143.0	12.896	-144385.	-12.7404
Farm	661437.0	878143.0	12.395	-144385.	-12.1082
LipsickSand_combo_180-181-182	618604.0	909069.0	-15.779	-1540107.	-1531.4938
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-20.004	-163636.	-29.8204
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-21.004	-163636.	-28.7203
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-22.004	-163636.	-27.6157
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-27.004	-163636.	-22.3808
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-32.004	-163636.	-17.2595
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-38.277	-163636.	-10.9237
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-44.551	-163636.	-4.6248
Pahokee_Cluster_RW-1-2-3_combo	767437.0	906262.0	16.547	-48129.	-2078.4772
Pahokee_Cluster_RW-1-2-3_combo	767437.0	906262.0	13.784	-48129.	-2051.4628
Pahokee_Cluster_RW-1-2-3_combo	767437.0	906262.0	11.022	-48129.	-2010.1733
Pahokee_Cluster_RW-1-2-3_combo	767437.0	906262.0	3.721	-48129.	-1021.4227
Ridgdill_and_Son_Pump1	686080.0	870502.0	-4.338	-866310.	-526.9482
Ridgdill_and_Son_Pump1	686080.0	870502.0	-13.439	-866310.	-439.7150
Ridgdill_and_Son_Pump2	686080.0	870197.0	-4.055	-866310.	-524.6134
Ridgdill_and_Son_Pump2	686080.0	870197.0	-13.326	-866310.	-429.4794
SuperStop_1-2-3-4-combo	680966.0	879858.0	14.122	-5776.	-6.7231
SuperStop_1-2-3-4-combo	680966.0	879858.0	10.798	-5776.	-3.3124
US_Sugar_Main_combo(275_276)	677297.0	879942.0	-41.779	-134759.	-2.1005
Run 65 (w/ Project): add one more dry well Clewiston_Fld_AT_S-2_1	689144.0	872904.0	1.214	-15401	-0.0956

Table G9. List of the 63 nodal locations where dewatering occurred at pump wells for Run 18 (w/o project) and Run 66 (w/ project).

Run 18 (w/o project) Dry Well Name	Florida East X-Coordinate	Florida East Y- Coordinate	Nodal Z-Coordinate	Pumping Max Rate, cfd	Computed Pressure Head, ft
Clewiston_Fld_AT_S-2_1	689144.0	872904.0	14.708	-15401.	-18.2072
Clewiston_Fld_AT_S-2_1	689144.0	872904.0	12.255	-15401.	-15.6104
Clewiston_Fld_AT_S-2_1	689144.0	872904.0	6.735	-15401.	-9.9992
Clewiston_Fld_AT_S-2_1	689144.0	872904.0	1.214	-15401.	-4.4266
DupuisReserve_5(remove)	794677.0	969277.0	19.308	-1155.	-10.6585
DupuisReserve_5(remove)	794677.0	969277.0	18.198	-1155.	-9.5225
DupuisReserve_5(remove)	794677.0	969277.0	17.088	-1155.	-8.3748
DupuisReserve_5(remove)	794677.0	969277.0	10.912	-1155.	-0.9958
DupuisReserve_3(remove)	793111.0	968159.0	17.798	-1925.	-10.1271
DupuisReserve_3(remove)	793111.0	968159.0	16.354	-1925.	-8.6412
DupuisReserve_3(remove)	793111.0	968159.0	10.642	-1925.	-1.9126
DupuisReserve_4(remove)	796413.0	969856.0	19.038	-1925.	-9.4736
DupuisReserve_4(remove)	796413.0	969856.0	17.886	-1925.	-8.2955
DupuisReserve_4(remove)	796413.0	969856.0	11.195	-1925.	-0.5934
DupuisReserve_5	793243.0	967580.0	18.922	-1925.	-14.1044
DupuisReserve_5	793243.0	967580.0	16.351	-1925.	-11.4007
DupuisReserve_5	793243.0	967580.0	10.623	-1925.	-3.8828
DupuisReserve_2	799833.0	970908.0	21.282	-3850.	-10.5718
DupuisReserve_2	799833.0	970908.0	19.490	-3850.	-8.7547
DupuisReserve_2	799833.0	970908.0	11.739	-3850.	-0.3076
DupuisReserve_3	794927.0	969185.0	20.076	-3850.	-14.8291
DupuisReserve_3	794927.0	969185.0	18.629	-3850.	-13.2739
DupuisReserve_3	794927.0	969185.0	17.182	-3850.	-11.7004
DupuisReserve_3	794927.0	969185.0	10.942	-3850.	-2.8733
DupuisReserve_1	799478.0	971605.0	21.032	-6353.	-11.3237
DupuisReserve_1	799478.0	971605.0	19.421	-6353.	-9.6773

Run 18 (w/o project) Dry Well Name	Florida East X-Coordinate	Florida East Y- Coordinate	Nodal Z-Coordinate	Pumping Max Rate, cfd	Computed Pressure Head, ft
DupuisReserve_1	799478.0	971605.0	11.750	-6353.	-0.7140
DupuisReserve_4	795045.0	969250.0	18.737	-6738.	-30.3754
DupuisReserve_4	795045.0	969250.0	17.240	-6738.	-27.8755
DupuisReserve_4	795045.0	969250.0	10.963	-6738.	-6.9739
DupuisReserve_8	793546.0	967422.0	19.214	-15401.	-158.1462
DupuisReserve_8	793546.0	967422.0	16.456	-15401.	-149.1252
DupuisReserve_8	793546.0	967422.0	10.651	-15401.	-33.3336
Farm	661437.0	878143.0	13.398	-144385.	-18.6733
Farm	661437.0	878143.0	12.896	-144385.	-18.0424
Farm	661437.0	878143.0	12.395	-144385.	-17.2733
Farm	661437.0	878143.0	-1.151	-144385.	-2.9265
JJ_Wiggins_Youth	617741.0	908330.0	-82.059	-11551.	-9.2066
Lake_Pt_LLC_Prop_P-3	787270.0	961014.0	-6.809	-192513.	-106.2941
Lake_Pt_LLC_Prop_P-3	787270.0	961014.0	-18.569	-192513.	-93.5419
Lake_Pt_LLC_Prop_P-4	790078.0	961014.0	-5.739	-192513.	-93.9224
Lake_Pt_LLC_Prop_P-4	790078.0	961014.0	-16.032	-192513.	-81.3003
Lake_Pt_LLC_Prop_P-5	790760.0	960177.0	-5.625	-192513.	-83.3864
Lake_Pt_LLC_Prop_P-5	790760.0	960177.0	-15.516	-192513.	-70.4597
LipsickSand_combo_180-181-182	618604.0	909069.0	-15.779	-1540107.	-2045.1127
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-20.004	-163636.	-51.6712
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-21.004	-163636.	-49.9331
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-22.004	-163636.	-48.0806
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-27.004	-163636.	-42.7300
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-32.004	-163636.	-37.4132
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-38.277	-163636.	-30.8331
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-44.551	-163636.	-24.3807
Pahokee_Cluster_RW-1-2-3_combo	767437.0	906262.0	16.547	-48129.	-2082.8270

Run 18 (w/o project) Dry Well Name	Florida East X-Coordinate	Florida East Y- Coordinate	Nodal Z-Coordinate	Pumping Max Rate, cfd	Computed Pressure Head, ft
Pahokee_Cluster_RW-1-2-3_combo	767437.0	906262.0	13.784	-48129.	-2055.8113
Pahokee_Cluster_RW-1-2-3_combo	767437.0	906262.0	11.022	-48129.	-2014.5385
Pahokee_Cluster_RW-1-2-3_combo	767437.0	906262.0	3.721	-48129.	-1026.5342
Ridgdill_and_Son_Pump1	686080.0	870502.0	-4.338	-866310.	-2350.9774
Ridgdill_and_Son_Pump1	686080.0	870502.0	-13.439	-866310.	-1970.2074
Ridgdill_and_Son_Pump2	686080.0	870197.0	-4.055	-866310.	-2361.1824
Ridgdill_and_Son_Pump2	686080.0	870197.0	-13.326	-866310.	-1934.9322
SuperStop_1-2-3-4-combo	680966.0	879858.0	14.122	-5776.	-8.8673
SuperStop_1-2-3-4-combo	680966.0	879858.0	10.798	-5776.	-5.4387
US_Sugar_Main_combo(275_276)	677297.0	879942.0	-41.779	-134759.	-6.4825
Run 66 (w/ Project): identical dry wells					

Table G10. List of the 55 nodal locations where dewatering occurred at pump wells for Run 19 (w/o project) and Run 67 (w/ project).

Run 19 (w/o project) Dry Well Name	Florida East X-Coordinate	Florida East Y- Coordinate	Nodal Z-Coordinate	Pumping Max Rate, cfd	Computed Pressure Head, ft
Clewiston_Fld_AT_S-2_1	689144.0	872904.0	14.708	-15401.	-13.6516
Clewiston_Fld_AT_S-2_1	689144.0	872904.0	12.255	-15401.	-11.1440
Clewiston_Fld_AT_S-2_1	689144.0	872904.0	6.735	-15401.	-5.5764
Clewiston_Fld_AT_S-2_1	689144.0	872904.0	1.214	-15401.	-0.0187
DupuisReserve_5(remove)	794677.0	969277.0	19.308	-1155.	-23.8372
DupuisReserve_5(remove)	794677.0	969277.0	18.198	-1155.	-22.6422
DupuisReserve_5(remove)	794677.0	969277.0	17.088	-1155.	-21.4771
DupuisReserve_5(remove)	794677.0	969277.0	10.912	-1155.	-4.2366
DupuisReserve_3(remove)	793111.0	968159.0	17.798	-1925.	-28.8611
DupuisReserve_3(remove)	793111.0	968159.0	16.354	-1925.	-27.2978
DupuisReserve_3(remove)	793111.0	968159.0	10.642	-1925.	-6.4661
DupuisReserve_4(remove)	796413.0	969856.0	19.038	-1925.	-29.2554
DupuisReserve_4(remove)	796413.0	969856.0	17.886	-1925.	-28.0258
DupuisReserve_4(remove)	796413.0	969856.0	11.195	-1925.	-5.7588
DupuisReserve_5	793243.0	967580.0	18.922	-1925.	-24.4352
DupuisReserve_5	793243.0	967580.0	16.351	-1925.	-21.6711
DupuisReserve_5	793243.0	967580.0	10.623	-1925.	-6.2778
DupuisReserve_2	799833.0	970908.0	21.282	-3850.	-21.4461
DupuisReserve_2	799833.0	970908.0	19.490	-3850.	-19.5843
DupuisReserve_2	799833.0	970908.0	11.739	-3850.	-3.3755
DupuisReserve_3	794927.0	969185.0	20.076	-3850.	-201.4058
DupuisReserve_3	794927.0	969185.0	18.629	-3850.	-199.6980
DupuisReserve_3	794927.0	969185.0	17.182	-3850.	-197.8203
DupuisReserve_3	794927.0	969185.0	10.942	-3850.	-30.1697
DupuisReserve_1	799478.0	971605.0	21.032	-6353.	-43.0695
DupuisReserve_1	799478.0	971605.0	19.421	-6353.	-41.3586
DupuisReserve_1	799478.0	971605.0	11.750	-6353.	-8.0470
DupuisReserve_4	795045.0	969250.0	18.737	-6738.	-473.7304
DupuisReserve_4	795045.0	969250.0	17.240	-6738.	-471.5838

Run 19 (w/o project) Dry Well Name	Florida East X-Coordinate	Florida East Y- Coordinate	Nodal Z-Coordinate	Pumping Max Rate, cfd	Computed Pressure Head, ft
DupuisReserve_4	795045.0	969250.0	10.963	-6738.	-229.5016
DupuisReserve_8	793546.0	967422.0	19.214	-15401.	-769.6156
DupuisReserve_8	793546.0	967422.0	16.456	-15401.	-764.3768
DupuisReserve_8	793546.0	967422.0	10.651	-15401.	-446.5967
Farm	661437.0	878143.0	13.398	-144385.	-13.3903
Farm	661437.0	878143.0	12.896	-144385.	-12.8324
Farm	661437.0	878143.0	12.395	-144385.	-12.1985
LipsickSand_combo_180-181-182	618604.0	909069.0	-15.779	-1540107.	-1532.6264
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-20.004	-163636.	-29.9768
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-21.004	-163636.	-28.8764
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-22.004	-163636.	-27.7715
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-27.004	-163636.	-22.5333
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-32.004	-163636.	-17.4099
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-38.277	-163636.	-11.0731
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-44.551	-163636.	-4.7740
Pahokee_Cluster_RW-1-2-3_combo	767437.0	906262.0	16.547	-48129.	-6654.7805
Pahokee_Cluster_RW-1-2-3_combo	767437.0	906262.0	13.784	-48129.	-6635.2803
Pahokee_Cluster_RW-1-2-3_combo	767437.0	906262.0	11.022	-48129.	-6619.2844
Pahokee_Cluster_RW-1-2-3_combo	767437.0	906262.0	3.721	-48129.	-3966.6593
Ridgdill_and_Son_Pump1	686080.0	870502.0	-4.338	-866310.	-529.3967
Ridgdill_and_Son_Pump1	686080.0	870502.0	-13.439	-866310.	-442.1593
Ridgdill_and_Son_Pump2	686080.0	870197.0	-4.055	-866310.	-527.3356
Ridgdill_and_Son_Pump2	686080.0	870197.0	-13.326	-866310.	-432.1936
SuperStop_1-2-3-4-combo	680966.0	879858.0	14.122	-5776.	-6.8472
SuperStop_1-2-3-4-combo	680966.0	879858.0	10.798	-5776.	-3.4356
US_Sugar_Main_combo(275_276)	677297.0	879942.0	-41.779	-134759.	-2.2500
Run 67 (w/ Project): identical dry wells					

Table G11. List of the 64 nodal locations where dewatering occurred at pump wells for Run 20 (w/o project) and Run 68 (w/ project).

Run 20 (w/o project) Dry Well Name	Florida East X-Coordinate	Florida East Y- Coordinate	Nodal Z-Coordinate	Pumping Max Rate, cfd	Computed Pressure Head, ft
Clewiston_Fld_AT_S-2_1	689144.0	872904.0	14.708	-15401.	-18.7804
Clewiston_Fld_AT_S-2_1	689144.0	872904.0	12.255	-15401.	-16.1820
Clewiston_Fld_AT_S-2_1	689144.0	872904.0	6.735	-15401.	-10.5577
Clewiston_Fld_AT_S-2_1	689144.0	872904.0	1.214	-15401.	-4.9819
DupuisReserve_5(remove)	794677.0	969277.0	19.308	-1155.	-33.7161
DupuisReserve_5(remove)	794677.0	969277.0	18.198	-1155.	-32.5071
DupuisReserve_5(remove)	794677.0	969277.0	17.088	-1155.	-31.3245
DupuisReserve_5(remove)	794677.0	969277.0	10.912	-1155.	-5.6265
DupuisReserve_3(remove)	793111.0	968159.0	17.798	-1925.	-67.1321
DupuisReserve_3(remove)	793111.0	968159.0	16.354	-1925.	-65.5285
DupuisReserve_3(remove)	793111.0	968159.0	10.642	-1925.	-12.7954
DupuisReserve_4(remove)	796413.0	969856.0	19.038	-1925.	-42.4201
DupuisReserve_4(remove)	796413.0	969856.0	17.886	-1925.	-41.1758
DupuisReserve_4(remove)	796413.0	969856.0	11.195	-1925.	-9.3324
DupuisReserve_5	793243.0	967580.0	18.922	-1925.	-55.1682
DupuisReserve_5	793243.0	967580.0	16.351	-1925.	-52.3710
DupuisReserve_5	793243.0	967580.0	10.623	-1925.	-12.4729
DupuisReserve_2	799833.0	970908.0	21.282	-3850.	-27.3262
DupuisReserve_2	799833.0	970908.0	19.490	-3850.	-25.4559
DupuisReserve_2	799833.0	970908.0	11.739	-3850.	-5.4299
DupuisReserve_3	794927.0	969185.0	20.076	-3850.	-240.8628
DupuisReserve_3	794927.0	969185.0	18.629	-3850.	-239.1585
DupuisReserve_3	794927.0	969185.0	17.182	-3850.	-237.2972
DupuisReserve_3	794927.0	969185.0	10.942	-3850.	-62.1866
DupuisReserve_1	799478.0	971605.0	21.032	-6353.	-79.5975
DupuisReserve_1	799478.0	971605.0	19.421	-6353.	-77.8602

Run 20 (w/o project) Dry Well Name	Florida East X-Coordinate	Florida East Y- Coordinate	Nodal Z-Coordinate	Pumping Max Rate, cfd	Computed Pressure Head, ft
DupuisReserve_1	799478.0	971605.0	11.750	-6353.	-10.9319
DupuisReserve_4	795045.0	969250.0	18.737	-6738.	-498.4424
DupuisReserve_4	795045.0	969250.0	17.240	-6738.	-496.3017
DupuisReserve_4	795045.0	969250.0	10.963	-6738.	-261.2498
DupuisReserve_8	793546.0	967422.0	19.214	-15401.	-799.6874
DupuisReserve_8	793546.0	967422.0	16.456	-15401.	-794.4330
DupuisReserve_8	793546.0	967422.0	10.651	-15401.	-489.2755
DupuisReserve_8	793546.0	967422.0	4.845	-15401.	-1.0276
Farm	661437.0	878143.0	13.398	-144385.	-18.8594
Farm	661437.0	878143.0	12.896	-144385.	-18.2202
Farm	661437.0	878143.0	12.395	-144385.	-17.4372
Farm	661437.0	878143.0	-1.151	-144385.	-3.0788
JJ_Wiggins_Youth	617741.0	908330.0	-82.059	-11551.	-9.3076
Lake_Pt_LLC_Prop_P-3	787270.0	961014.0	-6.809	-192513.	-123.0182
Lake_Pt_LLC_Prop_P-3	787270.0	961014.0	-18.569	-192513.	-115.1010
Lake_Pt_LLC_Prop_P-4	790078.0	961014.0	-5.739	-192513.	-106.1446
Lake_Pt_LLC_Prop_P-4	790078.0	961014.0	-16.032	-192513.	-94.2185
Lake_Pt_LLC_Prop_P-5	790760.0	960177.0	-5.625	-192513.	-95.8360
Lake_Pt_LLC_Prop_P-5	790760.0	960177.0	-15.516	-192513.	-83.5540
LipsickSand_combo_180-181-182	618604.0	909069.0	-15.779	-1540107.	-2045.6862
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-20.004	-163636.	-51.7948
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-21.004	-163636.	-50.0564
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-22.004	-163636.	-48.2032
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-27.004	-163636.	-42.8522
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-32.004	-163636.	-37.5350
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-38.277	-163636.	-30.9545
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-44.551	-163636.	-24.5008

Run 20 (w/o project) Dry Well Name	Florida East X-Coordinate	Florida East Y- Coordinate	Nodal Z-Coordinate	Pumping Max Rate, cfd	Computed Pressure Head, ft
Pahokee_Cluster_RW-1-2-3_combo	767437.0	906262.0	16.547	-48129.	-6657.3634
Pahokee_Cluster_RW-1-2-3_combo	767437.0	906262.0	13.784	-48129.	-6637.8611
Pahokee_Cluster_RW-1-2-3_combo	767437.0	906262.0	11.022	-48129.	-6621.8593
Pahokee_Cluster_RW-1-2-3_combo	767437.0	906262.0	3.721	-48129.	-3968.3301
Ridgdill_and_Son_Pump1	686080.0	870502.0	-4.338	-866310.	-2352.2762
Ridgdill_and_Son_Pump1	686080.0	870502.0	-13.439	-866310.	-1971.4953
Ridgdill_and_Son_Pump2	686080.0	870197.0	-4.055	-866310.	-2362.5122
Ridgdill_and_Son_Pump2	686080.0	870197.0	-13.326	-866310.	-1936.2504
SuperStop_1-2-3-4-combo	680966.0	879858.0	14.122	-5776.	-9.0406
SuperStop_1-2-3-4-combo	680966.0	879858.0	10.798	-5776.	-5.6100
US_Sugar_Main_combo(275_276)	677297.0	879942.0	-41.779	-134759.	-6.6959
Run 68 (w/ Project): identical dry wells					

Table G12. List of the 55 nodal locations where dewatering occurred at pump wells for Run 21 (w/o project) and Run 69 (w/ project).

Run21 (w/o project) Dry Well Name	Florida East X-Coordinate	Florida East Y- Coordinate	Nodal Z-Coordinate	Pumping Max Rate, cfd	Computed Pressure Head, ft
Clewiston_Fld_AT_S-2_1	689144.0	872904.0	14.708	-15401.	-13.4124
Clewiston_Fld_AT_S-2_1	689144.0	872904.0	12.255	-15401.	-10.9076
Clewiston_Fld_AT_S-2_1	689144.0	872904.0	6.735	-15401.	-5.3413
DupuisReserve_5(remove)	794677.0	969277.0	19.308	-1155.	-9.5670
DupuisReserve_5(remove)	794677.0	969277.0	18.198	-1155.	-8.4325
DupuisReserve_5(remove)	794677.0	969277.0	17.088	-1155.	-7.2826
DupuisReserve_5(remove)	794677.0	969277.0	10.912	-1155.	-0.0173
DupuisReserve_3(remove)	793111.0	968159.0	17.798	-1925.	-8.3919
DupuisReserve_3(remove)	793111.0	968159.0	16.354	-1925.	-6.9131
DupuisReserve_3(remove)	793111.0	968159.0	10.642	-1925.	-0.3076
DupuisReserve_4(remove)	796413.0	969856.0	19.038	-1925.	-8.7315
DupuisReserve_4(remove)	796413.0	969856.0	17.886	-1925.	-7.5552
DupuisReserve_5	793243.0	967580.0	18.922	-1925.	-11.2736
DupuisReserve_5	793243.0	967580.0	16.351	-1925.	-8.6101
DupuisReserve_5	793243.0	967580.0	10.623	-1925.	-1.2145
DupuisReserve_2	799833.0	970908.0	21.282	-3850.	-10.2069
DupuisReserve_2	799833.0	970908.0	19.490	-3850.	-8.3908
DupuisReserve_3	794927.0	969185.0	20.076	-3850.	-13.0253
DupuisReserve_3	794927.0	969185.0	18.629	-3850.	-11.4990
DupuisReserve_3	794927.0	969185.0	17.182	-3850.	-9.9684
DupuisReserve_3	794927.0	969185.0	10.942	-3850.	-1.4207
DupuisReserve_1	799478.0	971605.0	21.032	-6353.	-10.9671
DupuisReserve_1	799478.0	971605.0	19.421	-6353.	-9.3218
DupuisReserve_1	799478.0	971605.0	11.750	-6353.	-0.3825
DupuisReserve_4	795045.0	969250.0	18.737	-6738.	-25.3597
DupuisReserve_4	795045.0	969250.0	17.240	-6738.	-22.9285
DupuisReserve_4	795045.0	969250.0	10.963	-6738.	-5.0891
DupuisReserve_8	793546.0	967422.0	19.214	-15401.	-135.5270
DupuisReserve_8	793546.0	967422.0	16.456	-15401.	-126.3919

Run21 (w/o project) Dry Well Name	Florida East X-Coordinate	Florida East Y- Coordinate	Nodal Z-Coordinate	Pumping Max Rate, cfd	Computed Pressure Head, ft
DupuisReserve_8	793546.0	967422.0	10.651	-15401.	-19.5400
Farm	661437.0	878143.0	13.398	-144385.	-14.3066
Farm	661437.0	878143.0	12.896	-144385.	-13.7425
Farm	661437.0	878143.0	12.395	-144385.	-13.0955
JJ_Wiggins_Youth	617741.0	908330.0	-82.059	-11551.	-43.7177
Lake_Pt_LLC_Prop_P-4	790078.0	961014.0	-5.739	-192513.	-0.0437
Lake_Pt_LLC_Prop_P-5	790760.0	960177.0	-5.625	-192513.	-0.3437
LipsickSand_combo_180-181-182	618604.0	909069.0	-15.779	-1540107.	-4338.4736
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-20.004	-163636.	-168.4495
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-21.004	-163636.	-167.3580
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-22.004	-163636.	-166.2859
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-27.004	-163636.	-144.7197
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-32.004	-163636.	-118.8640
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-38.277	-163636.	-84.4780
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-44.551	-163636.	-53.6525
Pahokee_Cluster_RW-1-2-3_combo	767437.0	906262.0	16.547	-48129.	-2079.0010
Pahokee_Cluster_RW-1-2-3_combo	767437.0	906262.0	13.784	-48129.	-2051.9841
Pahokee_Cluster_RW-1-2-3_combo	767437.0	906262.0	11.022	-48129.	-2010.6938
Pahokee_Cluster_RW-1-2-3_combo	767437.0	906262.0	3.721	-48129.	-1021.9512
Ridgdill_and_Son_Pump1	686080.0	870502.0	-4.338	-866310.	-540.9769
Ridgdill_and_Son_Pump1	686080.0	870502.0	-13.439	-866310.	-454.4355
Ridgdill_and_Son_Pump2	686080.0	870197.0	-4.055	-866310.	-539.2977
Ridgdill_and_Son_Pump2	686080.0	870197.0	-13.326	-866310.	-444.8194
SuperStop_1-2-3-4-combo	680966.0	879858.0	14.122	-5776.	-7.3165
SuperStop_1-2-3-4-combo	680966.0	879858.0	10.798	-5776.	-3.9021
US_Sugar_Main_combo(275_276)	677297.0	879942.0	-41.779	-134759.	-4.7467
Run 69 (w/ Project): Add two more dry wells					
Clewiston_Fld_AT_S-2_1					
DupuisReserve_2	689144.0	872904.0	1.214	-15401.	-0.8493
	799833.0	970908.0	11.739	-3850.	-0.0155

Table G13. List of the 67 nodal locations where dewatering occurred at pump wells for Run 22 (w/o project) and Run 70 (w/ project).

Run 22 (w/o project) Dry Well Name	Florida East X-Coordinate	Florida East Y- Coordinate	Nodal Z-Coordinate	Pumping Max Rate, cfd	Computed Pressure Head, ft
Clewiston_Fld_AT_S-2_1	689144.0	872904.0	14.708	-15401.	-18.9061
Clewiston_Fld_AT_S-2_1	689144.0	872904.0	12.255	-15401.	-16.3078
Clewiston_Fld_AT_S-2_1	689144.0	872904.0	6.735	-15401.	-10.6818
Clewiston_Fld_AT_S-2_1	689144.0	872904.0	1.214	-15401.	-5.1057
DupuisReserve_5(remove)	794677.0	969277.0	19.308	-1155.	-11.9723
DupuisReserve_5(remove)	794677.0	969277.0	18.198	-1155.	-10.8347
DupuisReserve_5(remove)	794677.0	969277.0	17.088	-1155.	-9.6896
DupuisReserve_5(remove)	794677.0	969277.0	10.912	-1155.	-2.1667
DupuisReserve_3(remove)	793111.0	968159.0	17.798	-1925.	-11.6699
DupuisReserve_3(remove)	793111.0	968159.0	16.354	-1925.	-10.1752
DupuisReserve_3(remove)	793111.0	968159.0	10.642	-1925.	-3.3080
DupuisReserve_4(remove)	796413.0	969856.0	19.038	-1925.	-10.6994
DupuisReserve_4(remove)	796413.0	969856.0	17.886	-1925.	-9.5173
DupuisReserve_4(remove)	796413.0	969856.0	11.195	-1925.	-1.7215
DupuisReserve_5	793243.0	967580.0	18.922	-1925.	-16.8030
DupuisReserve_5	793243.0	967580.0	16.351	-1925.	-14.0049
DupuisReserve_5	793243.0	967580.0	10.623	-1925.	-6.3109
DupuisReserve_2	799833.0	970908.0	21.282	-3850.	-12.4254
DupuisReserve_2	799833.0	970908.0	19.490	-3850.	-10.6017
DupuisReserve_2	799833.0	970908.0	11.739	-3850.	-2.0546
DupuisReserve_3	794927.0	969185.0	20.076	-3850.	-17.6101
DupuisReserve_3	794927.0	969185.0	18.629	-3850.	-15.9792
DupuisReserve_3	794927.0	969185.0	17.182	-3850.	-14.3287
DupuisReserve_3	794927.0	969185.0	10.942	-3850.	-4.8305
DupuisReserve_1	799478.0	971605.0	21.032	-6353.	-13.3530
DupuisReserve_1	799478.0	971605.0	19.421	-6353.	-11.6968

Run 22 (w/o project) Dry Well Name	Florida East X-Coordinate	Florida East Y- Coordinate	Nodal Z-Coordinate	Pumping Max Rate, cfd	Computed Pressure Head, ft
DupuisReserve_1	799478.0	971605.0	11.750	-6353.	-2.5476
DupuisReserve_4	795045.0	969250.0	18.737	-6738.	-38.3864
DupuisReserve_4	795045.0	969250.0	17.240	-6738.	-35.7910
DupuisReserve_4	795045.0	969250.0	10.963	-6738.	-9.3701
DupuisReserve_8	793546.0	967422.0	19.214	-15401.	-179.4865
DupuisReserve_8	793546.0	967422.0	16.456	-15401.	-170.5527
DupuisReserve_8	793546.0	967422.0	10.651	-15401.	-47.5057
DupuisReserve_8	793546.0	967422.0	4.845	-15401.	-2.1850
Farm	661437.0	878143.0	13.398	-144385.	-21.9687
Farm	661437.0	878143.0	12.896	-144385.	-21.3078
Farm	661437.0	878143.0	12.395	-144385.	-20.4046
Farm	661437.0	878143.0	-1.151	-144385.	-5.8868
Glades_Sugar_NWSW_SWSW-combo	770626.0	862409.0	-5.216	-154010.	-0.2095
IndianTown_combo(139_140_141_142)	828167.0	977223.0	-55.067	-115508.	-2.1450
JJ_Wiggins_Youth	617741.0	908330.0	-82.059	-11551.	-162.5846
Lake_Pt_LLC_Prop_P-3	787270.0	961014.0	-6.809	-192513.	-229.9588
Lake_Pt_LLC_Prop_P-3	787270.0	961014.0	-18.569	-192513.	-253.7176
Lake_Pt_LLC_Prop_P-4	790078.0	961014.0	-5.739	-192513.	-216.8138
Lake_Pt_LLC_Prop_P-4	790078.0	961014.0	-16.032	-192513.	-212.4342
Lake_Pt_LLC_Prop_P-5	790760.0	960177.0	-5.625	-192513.	-215.2808
Lake_Pt_LLC_Prop_P-5	790760.0	960177.0	-15.516	-192513.	-210.2514
LipsickSand_combo_180-181-182	618604.0	909069.0	-15.779	-1540107.	-9955.4118
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-20.004	-163636.	-342.4431
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-21.004	-163636.	-340.9929
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-22.004	-163636.	-339.5038
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-27.004	-163636.	-312.1637
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-32.004	-163636.	-280.7351

Run 22 (w/o project) Dry Well Name	Florida East X-Coordinate	Florida East Y- Coordinate	Nodal Z-Coordinate	Pumping Max Rate, cfd	Computed Pressure Head, ft
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-38.277	-163636.	-238.9936
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-44.551	-163636.	-196.5042
Moore_Haven_Plant_Well-1	620786.0	904442.0	-6.367	-9626.	-6.6251
Pahokee_Cluster_RW-1-2-3_combo	767437.0	906262.0	16.547	-48129.	-2086.8260
Pahokee_Cluster_RW-1-2-3_combo	767437.0	906262.0	13.784	-48129.	-2059.7706
Pahokee_Cluster_RW-1-2-3_combo	767437.0	906262.0	11.022	-48129.	-2018.4877
Pahokee_Cluster_RW-1-2-3_combo	767437.0	906262.0	3.721	-48129.	-1030.5844
Ridgdill_and_Son_Pump1	686080.0	870502.0	-4.338	-866310.	-2459.3648
Ridgdill_and_Son_Pump1	686080.0	870502.0	-13.439	-866310.	-2096.4094
Ridgdill_and_Son_Pump2	686080.0	870197.0	-4.055	-866310.	-2465.9434
Ridgdill_and_Son_Pump2	686080.0	870197.0	-13.326	-866310.	-2056.7446
SuperStop_1-2-3-4-combo	680966.0	879858.0	14.122	-5776.	-10.2467
SuperStop_1-2-3-4-combo	680966.0	879858.0	10.798	-5776.	-6.8060
US_Sugar_Main_combo(275_276)	677297.0	879942.0	-41.779	-134759.	-10.6733
Run 70 (w/ Project): identical dry wells					

Table G14. List of the 58 nodal locations where dewatering occurred at pump wells for Run 23 (w/o project) and Run 71 (w/ project).

Run 23 (w/o project) Dry Well Name	Florida East X-Coordinate	Florida East Y- Coordinate	Nodal Z-Coordinate	Pumping Max Rate, cfd	Computed Pressure Head, ft
Clewiston_Fld_AT_S-2_1	689144.0	872904.0	14.708	-15401.	-13.9102
Clewiston_Fld_AT_S-2_1	689144.0	872904.0	12.255	-15401.	-11.3993
Clewiston_Fld_AT_S-2_1	689144.0	872904.0	6.735	-15401.	-5.8302
Clewiston_Fld_AT_S-2_1	689144.0	872904.0	1.214	-15401.	-0.2717
DupuisReserve_5(remove)	794677.0	969277.0	19.308	-1155.	-27.5711
DupuisReserve_5(remove)	794677.0	969277.0	18.198	-1155.	-26.3724
DupuisReserve_5(remove)	794677.0	969277.0	17.088	-1155.	-25.2035
DupuisReserve_5(remove)	794677.0	969277.0	10.912	-1155.	-5.0750
DupuisReserve_3(remove)	793111.0	968159.0	17.798	-1925.	-33.0434
DupuisReserve_3(remove)	793111.0	968159.0	16.354	-1925.	-31.4724
DupuisReserve_3(remove)	793111.0	968159.0	10.642	-1925.	-7.8759
DupuisReserve_4(remove)	796413.0	969856.0	19.038	-1925.	-33.8798
DupuisReserve_4(remove)	796413.0	969856.0	17.886	-1925.	-32.6445
DupuisReserve_4(remove)	796413.0	969856.0	11.195	-1925.	-7.3708
DupuisReserve_5	793243.0	967580.0	18.922	-1925.	-27.9585
DupuisReserve_5	793243.0	967580.0	16.351	-1925.	-25.1831
DupuisReserve_5	793243.0	967580.0	10.623	-1925.	-7.3087
DupuisReserve_2	799833.0	970908.0	21.282	-3850.	-26.1909
DupuisReserve_2	799833.0	970908.0	19.490	-3850.	-24.3216
DupuisReserve_2	799833.0	970908.0	11.739	-3850.	-4.9783
DupuisReserve_3	794927.0	969185.0	20.076	-3850.	-209.5432
DupuisReserve_3	794927.0	969185.0	18.629	-3850.	-207.8356
DupuisReserve_3	794927.0	969185.0	17.182	-3850.	-205.9604
DupuisReserve_3	794927.0	969185.0	10.942	-3850.	-35.8422
DupuisReserve_1	799478.0	971605.0	21.032	-6353.	-78.6171
DupuisReserve_1	799478.0	971605.0	19.421	-6353.	-76.8804
DupuisReserve_1	799478.0	971605.0	11.750	-6353.	-10.4153
DupuisReserve_4	795045.0	969250.0	18.737	-6738.	-480.0301
DupuisReserve_4	795045.0	969250.0	17.240	-6738.	-477.8853

Run 23 (w/o project) Dry Well Name	Florida East X-Coordinate	Florida East Y- Coordinate	Nodal Z-Coordinate	Pumping Max Rate, cfd	Computed Pressure Head, ft
DupuisReserve_4	795045.0	969250.0	10.963	-6738.	-237.7993
DupuisReserve_8	793546.0	967422.0	19.214	-15401.	-780.2699
DupuisReserve_8	793546.0	967422.0	16.456	-15401.	-775.0502
DupuisReserve_8	793546.0	967422.0	10.651	-15401.	-464.9765
Farm	661437.0	878143.0	13.398	-144385.	-14.4077
Farm	661437.0	878143.0	12.896	-144385.	-13.8424
Farm	661437.0	878143.0	12.395	-144385.	-13.1931
JJ_Wiggins_Youth	617741.0	908330.0	-82.059	-11551.	-44.0356
Lake_Pt_LLC_Prop_P-4	790078.0	961014.0	-5.739	-192513.	-1.2758
Lake_Pt_LLC_Prop_P-5	790760.0	960177.0	-5.625	-192513.	-1.4427
LipsickSand_combo_180-181-182	618604.0	909069.0	-15.779	-1540107.	-4339.2930
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-20.004	-163636.	-168.6153
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-21.004	-163636.	-167.5238
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-22.004	-163636.	-166.4517
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-27.004	-163636.	-144.8938
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-32.004	-163636.	-119.0466
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-38.277	-163636.	-84.6399
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-44.551	-163636.	-53.7753
Pahokee_Cluster_RW-1-2-3_combo	767437.0	906262.0	16.547	-48129.	-6655.7302
Pahokee_Cluster_RW-1-2-3_combo	767437.0	906262.0	13.784	-48129.	-6636.2287
Pahokee_Cluster_RW-1-2-3_combo	767437.0	906262.0	11.022	-48129.	-6620.2289
Pahokee_Cluster_RW-1-2-3_combo	767437.0	906262.0	3.721	-48129.	-3966.9628
Ridgdill_and_Son_Pump1	686080.0	870502.0	-4.338	-866310.	-543.7143
Ridgdill_and_Son_Pump1	686080.0	870502.0	-13.439	-866310.	-457.1667
Ridgdill_and_Son_Pump2	686080.0	870197.0	-4.055	-866310.	-542.0993
Ridgdill_and_Son_Pump2	686080.0	870197.0	-13.326	-866310.	-447.6144
SuperStop_1-2-3-4-combo	680966.0	879858.0	14.122	-5776.	-7.4580
SuperStop_1-2-3-4-combo	680966.0	879858.0	10.798	-5776.	-4.0425
US_Sugar_Main_combo(275_276)	677297.0	879942.0	-41.779	-134759.	-4.9165
Run 71 (w/ Project): identical dry wells					

Table G15. List of the 71 nodal locations where dewatering occurred at pump wells for Run 24 (w/o project) and Run 72 (w/ project).

Run 24 (w/o project) Dry Well Name	Florida East X-Coordinate	Florida East Y- Coordinate	Nodal Z-Coordinate	Pumping Max Rate, cfd	Computed Pressure Head, ft
Clewiston_Fld_AT_S-2_1	689144.0	872904.0	14.708	-15401.	-19.4834
Clewiston_Fld_AT_S-2_1	689144.0	872904.0	12.255	-15401.	-16.8838
Clewiston_Fld_AT_S-2_1	689144.0	872904.0	6.735	-15401.	-11.2434
Clewiston_Fld_AT_S-2_1	689144.0	872904.0	1.214	-15401.	-5.6636
DupuisReserve_5(remove)	794677.0	969277.0	19.308	-1155.	-49.6675
DupuisReserve_5(remove)	794677.0	969277.0	18.198	-1155.	-48.4444
DupuisReserve_5(remove)	794677.0	969277.0	17.088	-1155.	-47.2417
DupuisReserve_5(remove)	794677.0	969277.0	10.912	-1155.	-7.8487
DupuisReserve_3(remove)	793111.0	968159.0	17.798	-1925.	-78.0901
DupuisReserve_3(remove)	793111.0	968159.0	16.354	-1925.	-76.4880
DupuisReserve_3(remove)	793111.0	968159.0	10.642	-1925.	-20.2672
DupuisReserve_3(remove)	793111.0	968159.0	4.929	-1925.	-1.5812
DupuisReserve_4(remove)	796413.0	969856.0	19.038	-1925.	-73.4551
DupuisReserve_4(remove)	796413.0	969856.0	17.886	-1925.	-72.1963
DupuisReserve_4(remove)	796413.0	969856.0	11.195	-1925.	-13.4897
DupuisReserve_5	793243.0	967580.0	18.922	-1925.	-66.4286
DupuisReserve_5	793243.0	967580.0	16.351	-1925.	-63.6320
DupuisReserve_5	793243.0	967580.0	10.623	-1925.	-23.2515
DupuisReserve_5	793243.0	967580.0	4.895	-1925.	-3.8286
DupuisReserve_2	799833.0	970908.0	21.282	-3850.	-40.6066
DupuisReserve_2	799833.0	970908.0	19.490	-3850.	-38.7218
DupuisReserve_2	799833.0	970908.0	11.739	-3850.	-9.8455
DupuisReserve_3	794927.0	969185.0	20.076	-3850.	-308.8872
DupuisReserve_3	794927.0	969185.0	18.629	-3850.	-307.1955
DupuisReserve_3	794927.0	969185.0	17.182	-3850.	-305.3734
DupuisReserve_3	794927.0	969185.0	10.942	-3850.	-149.4026

Run 24 (w/o project) Dry Well Name	Florida East X-Coordinate	Florida East Y- Coordinate	Nodal Z-Coordinate	Pumping Max Rate, cfd	Computed Pressure Head, ft
DupuisReserve_3	794927.0	969185.0	4.702	-3850.	-0.4143
DupuisReserve_1	799478.0	971605.0	21.032	-6353.	-91.7517
DupuisReserve_1	799478.0	971605.0	19.421	-6353.	-90.0087
DupuisReserve_1	799478.0	971605.0	11.750	-6353.	-16.4396
DupuisReserve_4	795045.0	969250.0	18.737	-6738.	-523.2181
DupuisReserve_4	795045.0	969250.0	17.240	-6738.	-521.0669
DupuisReserve_4	795045.0	969250.0	10.963	-6738.	-280.7907
DupuisReserve_4	795045.0	969250.0	4.687	-6738.	-0.4477
DupuisReserve_8	793546.0	967422.0	19.214	-15401.	-820.9693
DupuisReserve_8	793546.0	967422.0	16.456	-15401.	-815.6452
DupuisReserve_8	793546.0	967422.0	10.651	-15401.	-497.3676
DupuisReserve_8	793546.0	967422.0	4.845	-15401.	-5.9924
Farm	661437.0	878143.0	13.398	-144385.	-22.1679
Farm	661437.0	878143.0	12.896	-144385.	-21.5061
Farm	661437.0	878143.0	12.395	-144385.	-20.6007
Farm	661437.0	878143.0	-1.151	-144385.	-6.0629
Glades_Sugar_NWSW_SWSW-combo	770626.0	862409.0	-5.216	-154010.	-1.5707
IndianTown_combo(139_140_141_142)	828167.0	977223.0	-55.067	-115508.	-3.1697
JJ_Wiggins_Youth	617741.0	908330.0	-82.059	-11551.	-162.8803
Lake_Pt_LLC_Prop_P-3	787270.0	961014.0	-6.809	-192513.	-240.4487
Lake_Pt_LLC_Prop_P-3	787270.0	961014.0	-18.569	-192513.	-264.1690
Lake_Pt_LLC_Prop_P-4	790078.0	961014.0	-5.739	-192513.	-244.9691
Lake_Pt_LLC_Prop_P-4	790078.0	961014.0	-16.032	-192513.	-242.0651
Lake_Pt_LLC_Prop_P-5	790760.0	960177.0	-5.625	-192513.	-232.5094
Lake_Pt_LLC_Prop_P-5	790760.0	960177.0	-15.516	-192513.	-228.1393
LipsickSand_combo_180-181-182	618604.0	909069.0	-15.779	-1540107.	-9956.2022
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-20.004	-163636.	-342.5222

Run 24 (w/o project) Dry Well Name	Florida East X-Coordinate	Florida East Y- Coordinate	Nodal Z-Coordinate	Pumping Max Rate, cfd	Computed Pressure Head, ft
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-21.004	-163636.	-341.0719
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-22.004	-163636.	-339.5829
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-27.004	-163636.	-312.2425
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-32.004	-163636.	-280.8132
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-38.277	-163636.	-239.0717
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-44.551	-163636.	-196.5829
Moore_Haven_Plant_Well-1	620786.0	904442.0	-6.367	-9626.	-6.6664
Pahokee_Cluster_RW-1-2-3_combo	767437.0	906262.0	16.547	-48129.	-6664.1872
Pahokee_Cluster_RW-1-2-3_combo	767437.0	906262.0	13.784	-48129.	-6644.6738
Pahokee_Cluster_RW-1-2-3_combo	767437.0	906262.0	11.022	-48129.	-6628.6453
Pahokee_Cluster_RW-1-2-3_combo	767437.0	906262.0	3.721	-48129.	-3970.9560
Ridgdill_and_Son_Pump1	686080.0	870502.0	-4.338	-866310.	-2546.2986
Ridgdill_and_Son_Pump1	686080.0	870502.0	-13.439	-866310.	-2186.2360
Ridgdill_and_Son_Pump2	686080.0	870197.0	-4.055	-866310.	-2544.7471
Ridgdill_and_Son_Pump2	686080.0	870197.0	-13.326	-866310.	-2138.0006
SuperStop_1-2-3-4-combo	680966.0	879858.0	14.122	-5776.	-10.4562
SuperStop_1-2-3-4-combo	680966.0	879858.0	10.798	-5776.	-7.0127
US_Sugar_Main_combo(275_276)	677297.0	879942.0	-41.779	-134759.	-10.9374
Run 72 (w/ Project): identical dry wells					

Table G16. List of the 58 nodal locations where dewatering occurred at pump wells for Run 33 (w/o project) and Run 81 (w/ project).

Run 33 (w/o project) Dry Well Name	Florida East X-Coordinate	Florida East Y- Coordinate	Nodal Z-Coordinate	Pumping Max Rate, cfd	Computed Pressure Head, ft
Clewiston_Fld_AT_S-2_1	689144.0	872904.0	14.708	-15401.	-21.8354
Clewiston_Fld_AT_S-2_1	689144.0	872904.0	12.255	-15401.	-19.2328
Clewiston_Fld_AT_S-2_1	689144.0	872904.0	6.735	-15401.	-13.5041
Clewiston_Fld_AT_S-2_1	689144.0	872904.0	1.214	-15401.	-7.8978
DupuisReserve_5(remove)	794677.0	969277.0	19.308	-1155.	-12.1396
DupuisReserve_5(remove)	794677.0	969277.0	18.198	-1155.	-10.9966
DupuisReserve_5(remove)	794677.0	969277.0	17.088	-1155.	-9.8460
DupuisReserve_5(remove)	794677.0	969277.0	10.912	-1155.	-2.2977
DupuisReserve_3(remove)	793111.0	968159.0	17.798	-1925.	-10.9154
DupuisReserve_3(remove)	793111.0	968159.0	16.354	-1925.	-9.4249
DupuisReserve_3(remove)	793111.0	968159.0	10.642	-1925.	-2.6189
DupuisReserve_4(remove)	796413.0	969856.0	19.038	-1925.	-11.1952
DupuisReserve_4(remove)	796413.0	969856.0	17.886	-1925.	-10.0106
DupuisReserve_4(remove)	796413.0	969856.0	11.195	-1925.	-2.1478
DupuisReserve_5	793243.0	967580.0	18.922	-1925.	-13.8673
DupuisReserve_5	793243.0	967580.0	16.351	-1925.	-11.1671
DupuisReserve_5	793243.0	967580.0	10.623	-1925.	-3.6041
DupuisReserve_2	799833.0	970908.0	21.282	-3850.	-12.4215
DupuisReserve_2	799833.0	970908.0	19.490	-3850.	-10.5964
DupuisReserve_2	799833.0	970908.0	11.739	-3850.	-2.0245
DupuisReserve_3	794927.0	969185.0	20.076	-3850.	-16.0375
DupuisReserve_3	794927.0	969185.0	18.629	-3850.	-14.4513
DupuisReserve_3	794927.0	969185.0	17.182	-3850.	-12.8352
DupuisReserve_3	794927.0	969185.0	10.942	-3850.	-3.6997
DupuisReserve_1	799478.0	971605.0	21.032	-6353.	-13.2551
DupuisReserve_1	799478.0	971605.0	19.421	-6353.	-11.5958
DupuisReserve_1	799478.0	971605.0	11.750	-6353.	-2.3935
DupuisReserve_4	795045.0	969250.0	18.737	-6738.	-33.3999
DupuisReserve_4	795045.0	969250.0	17.240	-6738.	-30.8359

Run 33 (w/o project) Dry Well Name	Florida East X-Coordinate	Florida East Y- Coordinate	Nodal Z-Coordinate	Pumping Max Rate, cfd	Computed Pressure Head, ft
DupuisReserve_4	795045.0	969250.0	10.963	-6738.	-7.8070
DupuisReserve_8	793546.0	967422.0	19.214	-15401.	-151.7182
DupuisReserve_8	793546.0	967422.0	16.456	-15401.	-142.6595
DupuisReserve_8	793546.0	967422.0	10.651	-15401.	-29.0900
Farm	661437.0	878143.0	13.398	-144385.	-20.1106
Farm	661437.0	878143.0	12.896	-144385.	-19.4221
Farm	661437.0	878143.0	12.395	-144385.	-18.4514
Farm	661437.0	878143.0	-1.151	-144385.	-3.8464
Lake_Pt_LLC_Prop_P-4	790078.0	961014.0	-5.739	-192513.	-1.6353
Lake_Pt_LLC_Prop_P-5	790760.0	960177.0	-5.625	-192513.	-1.7958
LipsickSand_combo_180-181-182	618604.0	909069.0	-15.779	-1540107.	-1547.9806
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-20.004	-163636.	-34.5460
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-21.004	-163636.	-33.4393
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-22.004	-163636.	-32.3264
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-27.004	-163636.	-27.0636
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-32.004	-163636.	-21.8563
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-38.277	-163636.	-15.4811
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-44.551	-163636.	-9.1717
Pahokee_Cluster_RW-1-2-3_combo	767437.0	906262.0	16.547	-48129.	-2082.0672
Pahokee_Cluster_RW-1-2-3_combo	767437.0	906262.0	13.784	-48129.	-2055.0190
Pahokee_Cluster_RW-1-2-3_combo	767437.0	906262.0	11.022	-48129.	-2013.7171
Pahokee_Cluster_RW-1-2-3_combo	767437.0	906262.0	3.721	-48129.	-1024.9511
Ridgdill_and_Son_Pump1	686080.0	870502.0	-4.338	-866310.	-572.5138
Ridgdill_and_Son_Pump1	686080.0	870502.0	-13.439	-866310.	-485.2047
Ridgdill_and_Son_Pump2	686080.0	870197.0	-4.055	-866310.	-569.9079
Ridgdill_and_Son_Pump2	686080.0	870197.0	-13.326	-866310.	-474.6894
SuperStop_1-2-3-4-combo	680966.0	879858.0	14.122	-5776.	-16.6765
SuperStop_1-2-3-4-combo	680966.0	879858.0	10.798	-5776.	-12.9326
US_Sugar_Main_combo(275_276)	677297.0	879942.0	-41.779	-134759.	-10.7540
Run 81 (w/ Project): identical dry wells					

Table G17. List of the 66 nodal locations where dewatering occurred at pump wells for Run 34 and Run 82 (w/ project).

Run 34 (w/o project) Dry Well Name	Florida East X-Coordinate	Florida East Y- Coordinate	Nodal Z-Coordinate	Pumping Max Rate, cfd	Computed Pressure Head, ft
Clewiston_Fld_AT_S-2_1	689144.0	872904.0	14.708	-15401.	-28.6826
Clewiston_Fld_AT_S-2_1	689144.0	872904.0	12.255	-15401.	-26.0804
Clewiston_Fld_AT_S-2_1	689144.0	872904.0	6.735	-15401.	-20.3202
Clewiston_Fld_AT_S-2_1	689144.0	872904.0	1.214	-15401.	-14.4942
Clewiston_Fld_AT_S-2_1	689144.0	872904.0	-10.648	-15401.	-2.4923
DupuisReserve_5(remove)	794677.0	969277.0	19.308	-1155.	-14.4101
DupuisReserve_5(remove)	794677.0	969277.0	18.198	-1155.	-13.2485
DupuisReserve_5(remove)	794677.0	969277.0	17.088	-1155.	-12.0986
DupuisReserve_5(remove)	794677.0	969277.0	10.912	-1155.	-4.0560
DupuisReserve_3(remove)	793111.0	968159.0	17.798	-1925.	-13.6682
DupuisReserve_3(remove)	793111.0	968159.0	16.354	-1925.	-12.1534
DupuisReserve_3(remove)	793111.0	968159.0	10.642	-1925.	-5.0335
DupuisReserve_4(remove)	796413.0	969856.0	19.038	-1925.	-12.9176
DupuisReserve_4(remove)	796413.0	969856.0	17.886	-1925.	-11.7234
DupuisReserve_4(remove)	796413.0	969856.0	11.195	-1925.	-3.6750
DupuisReserve_5	793243.0	967580.0	18.922	-1925.	-18.1782
DupuisReserve_5	793243.0	967580.0	16.351	-1925.	-15.2998
DupuisReserve_5	793243.0	967580.0	10.623	-1925.	-7.3076
DupuisReserve_5	793243.0	967580.0	4.895	-1925.	-0.1031
DupuisReserve_2	799833.0	970908.0	21.282	-3850.	-13.9830
DupuisReserve_2	799833.0	970908.0	19.490	-3850.	-12.1473
DupuisReserve_2	799833.0	970908.0	11.739	-3850.	-3.4538
DupuisReserve_3	794927.0	969185.0	20.076	-3850.	-19.4903
DupuisReserve_3	794927.0	969185.0	18.629	-3850.	-17.7997
DupuisReserve_3	794927.0	969185.0	17.182	-3850.	-16.0418
DupuisReserve_3	794927.0	969185.0	10.942	-3850.	-6.1177

Run 34 (w/o project) Dry Well Name	Florida East X-Coordinate	Florida East Y- Coordinate	Nodal Z-Coordinate	Pumping Max Rate, cfd	Computed Pressure Head, ft
DupuisReserve_1	799478.0	971605.0	21.032	-6353.	-14.8270
DupuisReserve_1	799478.0	971605.0	19.421	-6353.	-13.1528
DupuisReserve_1	799478.0	971605.0	11.750	-6353.	-3.7411
DupuisReserve_4	795045.0	969250.0	18.737	-6738.	-57.2788
DupuisReserve_4	795045.0	969250.0	17.240	-6738.	-54.5958
DupuisReserve_4	795045.0	969250.0	10.963	-6738.	-10.7932
DupuisReserve_8	793546.0	967422.0	19.214	-15401.	-180.9956
DupuisReserve_8	793546.0	967422.0	16.456	-15401.	-172.0516
DupuisReserve_8	793546.0	967422.0	10.651	-15401.	-49.1144
DupuisReserve_8	793546.0	967422.0	4.845	-15401.	-2.1832
Farm	661437.0	878143.0	13.398	-144385.	-27.2696
Farm	661437.0	878143.0	12.896	-144385.	-26.5664
Farm	661437.0	878143.0	12.395	-144385.	-25.5567
Farm	661437.0	878143.0	-1.151	-144385.	-10.2066
JJ_Wiggins_Youth	617741.0	908330.0	-82.059	-11551.	-14.3133
Lake_Pt_LLC_Prop_P-3	787270.0	961014.0	-6.809	-192513.	-129.5177
Lake_Pt_LLC_Prop_P-3	787270.0	961014.0	-18.569	-192513.	-123.4441
Lake_Pt_LLC_Prop_P-4	790078.0	961014.0	-5.739	-192513.	-113.3875
Lake_Pt_LLC_Prop_P-4	790078.0	961014.0	-16.032	-192513.	-101.8741
Lake_Pt_LLC_Prop_P-5	790760.0	960177.0	-5.625	-192513.	-106.3977
Lake_Pt_LLC_Prop_P-5	790760.0	960177.0	-15.516	-192513.	-94.6973
LipsickSand_combo_180-181-182	618604.0	909069.0	-15.779	-1540107.	-2064.2407
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-20.004	-163636.	-59.4273
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-21.004	-163636.	-57.6848
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-22.004	-163636.	-55.8152
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-27.004	-163636.	-50.4444
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-32.004	-163636.	-45.1014

Run 34 (w/o project) Dry Well Name	Florida East X-Coordinate	Florida East Y- Coordinate	Nodal Z-Coordinate	Pumping Max Rate, cfd	Computed Pressure Head, ft
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-38.277	-163636.	-38.4933
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-44.551	-163636.	-31.9934
Pahokee_Cluster_RW-1-2-3_combo	767437.0	906262.0	16.547	-48129.	-2086.4984
Pahokee_Cluster_RW-1-2-3_combo	767437.0	906262.0	13.784	-48129.	-2059.4324
Pahokee_Cluster_RW-1-2-3_combo	767437.0	906262.0	11.022	-48129.	-2018.1422
Pahokee_Cluster_RW-1-2-3_combo	767437.0	906262.0	3.721	-48129.	-1030.1254
Ridgdill_and_Son_Pump1	686080.0	870502.0	-4.338	-866310.	-2483.5438
Ridgdill_and_Son_Pump1	686080.0	870502.0	-13.439	-866310.	-2105.5771
Ridgdill_and_Son_Pump2	686080.0	870197.0	-4.055	-866310.	-2489.4958
Ridgdill_and_Son_Pump2	686080.0	870197.0	-13.326	-866310.	-2065.9877
SuperStop_1-2-3-4-combo	680966.0	879858.0	14.122	-5776.	-20.6159
SuperStop_1-2-3-4-combo	680966.0	879858.0	10.798	-5776.	-16.6711
US_Sugar_Main_combo(275_276)	677297.0	879942.0	-41.779	-134759.	-16.9169
Run 82 (w/ Project): identical dry wells					

Table G18. List of the 58 nodal locations where dewatering occurred at pump wells for Run 35 and Run 83 (w/ project).

Run 35 (w/o project) Dry Well Name	Florida East X-Coordinate	Florida East Y- Coordinate	Nodal Z-Coordinate	Pumping Max Rate, cfd	Computed Pressure Head, ft
Clewiston_Fld_AT_S-2_1	689144.0	872904.0	14.708	-15401.	-22.5787
Clewiston_Fld_AT_S-2_1	689144.0	872904.0	12.255	-15401.	-19.9761
Clewiston_Fld_AT_S-2_1	689144.0	872904.0	6.735	-15401.	-14.2184
Clewiston_Fld_AT_S-2_1	689144.0	872904.0	1.214	-15401.	-8.6009
DupuisReserve_5(remove)	794677.0	969277.0	19.308	-1155.	-32.6041
DupuisReserve_5(remove)	794677.0	969277.0	18.198	-1155.	-31.3978
DupuisReserve_5(remove)	794677.0	969277.0	17.088	-1155.	-30.2205
DupuisReserve_5(remove)	794677.0	969277.0	10.912	-1155.	-6.1481
DupuisReserve_3(remove)	793111.0	968159.0	17.798	-1925.	-47.9140
DupuisReserve_3(remove)	793111.0	968159.0	16.354	-1925.	-46.3192
DupuisReserve_3(remove)	793111.0	968159.0	10.642	-1925.	-10.3626
DupuisReserve_4(remove)	796413.0	969856.0	19.038	-1925.	-43.6972
DupuisReserve_4(remove)	796413.0	969856.0	17.886	-1925.	-42.4508
DupuisReserve_4(remove)	796413.0	969856.0	11.195	-1925.	-9.4328
DupuisReserve_5	793243.0	967580.0	18.922	-1925.	-34.8487
DupuisReserve_5	793243.0	967580.0	16.351	-1925.	-32.0561
DupuisReserve_5	793243.0	967580.0	10.623	-1925.	-9.0550
DupuisReserve_2	799833.0	970908.0	21.282	-3850.	-29.6625
DupuisReserve_2	799833.0	970908.0	19.490	-3850.	-27.7879
DupuisReserve_2	799833.0	970908.0	11.739	-3850.	-6.3708
DupuisReserve_3	794927.0	969185.0	20.076	-3850.	-223.4329
DupuisReserve_3	794927.0	969185.0	18.629	-3850.	-221.7256
DupuisReserve_3	794927.0	969185.0	17.182	-3850.	-219.8548
DupuisReserve_3	794927.0	969185.0	10.942	-3850.	-45.9604
DupuisReserve_1	799478.0	971605.0	21.032	-6353.	-83.3786
DupuisReserve_1	799478.0	971605.0	19.421	-6353.	-81.6363
DupuisReserve_1	799478.0	971605.0	11.750	-6353.	-12.0573
DupuisReserve_4	795045.0	969250.0	18.737	-6738.	-489.5196
DupuisReserve_4	795045.0	969250.0	17.240	-6738.	-487.3765

Run 35 (w/o project) Dry Well Name	Florida East X-Coordinate	Florida East Y- Coordinate	Nodal Z-Coordinate	Pumping Max Rate, cfd	Computed Pressure Head, ft
DupuisReserve_4	795045.0	969250.0	10.963	-6738.	-249.8103
DupuisReserve_8	793546.0	967422.0	19.214	-15401.	-790.4598
DupuisReserve_8	793546.0	967422.0	16.456	-15401.	-785.2446
DupuisReserve_8	793546.0	967422.0	10.651	-15401.	-480.8711
Farm	661437.0	878143.0	13.398	-144385.	-20.2970
Farm	661437.0	878143.0	12.896	-144385.	-19.6074
Farm	661437.0	878143.0	12.395	-144385.	-18.6339
Farm	661437.0	878143.0	-1.151	-144385.	-4.0064
Lake_Pt_LLC_Prop_P-4	790078.0	961014.0	-5.739	-192513.	-2.5214
Lake_Pt_LLC_Prop_P-5	790760.0	960177.0	-5.625	-192513.	-2.5369
LipsickSand_combo_180-181-182	618604.0	909069.0	-15.779	-1540107.	-1549.0712
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-20.004	-163636.	-34.7728
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-21.004	-163636.	-33.6657
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-22.004	-163636.	-32.5525
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-27.004	-163636.	-27.2887
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-32.004	-163636.	-22.0779
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-38.277	-163636.	-15.7000
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-44.551	-163636.	-9.3899
Pahokee_Cluster_RW-1-2-3_combo	767437.0	906262.0	16.547	-48129.	-6662.8140
Pahokee_Cluster_RW-1-2-3_combo	767437.0	906262.0	13.784	-48129.	-6643.2969
Pahokee_Cluster_RW-1-2-3_combo	767437.0	906262.0	11.022	-48129.	-6627.2639
Pahokee_Cluster_RW-1-2-3_combo	767437.0	906262.0	3.721	-48129.	-3969.4877
Ridgdill_and_Son_Pump1	686080.0	870502.0	-4.338	-866310.	-575.8043
Ridgdill_and_Son_Pump1	686080.0	870502.0	-13.439	-866310.	-488.4904
Ridgdill_and_Son_Pump2	686080.0	870197.0	-4.055	-866310.	-573.1465
Ridgdill_and_Son_Pump2	686080.0	870197.0	-13.326	-866310.	-477.9234
SuperStop_1-2-3-4-combo	680966.0	879858.0	14.122	-5776.	-17.2083
SuperStop_1-2-3-4-combo	680966.0	879858.0	10.798	-5776.	-13.4169
US_Sugar_Main_combo(275_276)	677297.0	879942.0	-41.779	-134759.	-11.1290
Run 83 (w/ Project): identical dry wells					

Table G19. List of the 67 nodal locations where dewatering occurred at pump wells for Run 36 and Run 84 (w/ project).

Run 36 (w/o project) Dry Well Name	Florida East X-Coordinate	Florida East Y- Coordinate	Nodal Z-Coordinate	Pumping Max Rate, cfd	Computed Pressure Head, ft
Clewiston_Fld_AT_S-2_1	689144.0	872904.0	14.708	-15401.	-29.3207
Clewiston_Fld_AT_S-2_1	689144.0	872904.0	12.255	-15401.	-26.7185
Clewiston_Fld_AT_S-2_1	689144.0	872904.0	6.735	-15401.	-20.9582
Clewiston_Fld_AT_S-2_1	689144.0	872904.0	1.214	-15401.	-15.1290
Clewiston_Fld_AT_S-2_1	689144.0	872904.0	-10.648	-15401.	-3.1143
DupuisReserve_5(remove)	794677.0	969277.0	19.308	-1155.	-50.3060
DupuisReserve_5(remove)	794677.0	969277.0	18.198	-1155.	-49.0821
DupuisReserve_5(remove)	794677.0	969277.0	17.088	-1155.	-47.8787
DupuisReserve_5(remove)	794677.0	969277.0	10.912	-1155.	-7.9024
DupuisReserve_3(remove)	793111.0	968159.0	17.798	-1925.	-78.4606
DupuisReserve_3(remove)	793111.0	968159.0	16.354	-1925.	-76.8578
DupuisReserve_3(remove)	793111.0	968159.0	10.642	-1925.	-20.3204
DupuisReserve_3(remove)	793111.0	968159.0	4.929	-1925.	-1.5519
DupuisReserve_4(remove)	796413.0	969856.0	19.038	-1925.	-74.6488
DupuisReserve_4(remove)	796413.0	969856.0	17.886	-1925.	-73.3893
DupuisReserve_4(remove)	796413.0	969856.0	11.195	-1925.	-13.9262
DupuisReserve_5	793243.0	967580.0	18.922	-1925.	-64.2663
DupuisReserve_5	793243.0	967580.0	16.351	-1925.	-61.4676
DupuisReserve_5	793243.0	967580.0	10.623	-1925.	-20.8240
DupuisReserve_5	793243.0	967580.0	4.895	-1925.	-3.0845
DupuisReserve_2	799833.0	970908.0	21.282	-3850.	-39.5271
DupuisReserve_2	799833.0	970908.0	19.490	-3850.	-37.6412
DupuisReserve_2	799833.0	970908.0	11.739	-3850.	-9.4294
DupuisReserve_3	794927.0	969185.0	20.076	-3850.	-308.2532
DupuisReserve_3	794927.0	969185.0	18.629	-3850.	-306.5609
DupuisReserve_3	794927.0	969185.0	17.182	-3850.	-304.7381

Run 36 (w/o project) Dry Well Name	Florida East X-Coordinate	Florida East Y- Coordinate	Nodal Z-Coordinate	Pumping Max Rate, cfd	Computed Pressure Head, ft
DupuisReserve_3	794927.0	969185.0	10.942	-3850.	-148.5790
DupuisReserve_1	799478.0	971605.0	21.032	-6353.	-91.3868
DupuisReserve_1	799478.0	971605.0	19.421	-6353.	-89.6423
DupuisReserve_1	799478.0	971605.0	11.750	-6353.	-15.6295
DupuisReserve_4	795045.0	969250.0	18.737	-6738.	-521.9670
DupuisReserve_4	795045.0	969250.0	17.240	-6738.	-519.8146
DupuisReserve_4	795045.0	969250.0	10.963	-6738.	-278.7015
DupuisReserve_8	793546.0	967422.0	19.214	-15401.	-819.3858
DupuisReserve_8	793546.0	967422.0	16.456	-15401.	-814.0644
DupuisReserve_8	793546.0	967422.0	10.651	-15401.	-496.2407
DupuisReserve_8	793546.0	967422.0	4.845	-15401.	-4.4108
Farm	661437.0	878143.0	13.398	-144385.	-27.4410
Farm	661437.0	878143.0	12.896	-144385.	-26.7370
Farm	661437.0	878143.0	12.395	-144385.	-25.7251
Farm	661437.0	878143.0	-1.151	-144385.	-10.3454
JJ_Wiggins_Youth	617741.0	908330.0	-82.059	-11551.	-14.4462
Lake_Pt_LLC_Prop_P-3	787270.0	961014.0	-6.809	-192513.	-144.1113
Lake_Pt_LLC_Prop_P-3	787270.0	961014.0	-18.569	-192513.	-142.0343
Lake_Pt_LLC_Prop_P-4	790078.0	961014.0	-5.739	-192513.	-122.9035
Lake_Pt_LLC_Prop_P-4	790078.0	961014.0	-16.032	-192513.	-111.7328
Lake_Pt_LLC_Prop_P-5	790760.0	960177.0	-5.625	-192513.	-115.2298
Lake_Pt_LLC_Prop_P-5	790760.0	960177.0	-15.516	-192513.	-103.8857
LipsickSand_combo_180-181-182	618604.0	909069.0	-15.779	-1540107.	-2065.1825
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-20.004	-163636.	-59.5980
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-21.004	-163636.	-57.8555
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-22.004	-163636.	-55.9860
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-27.004	-163636.	-50.6148

Run 36 (w/o project) Dry Well Name	Florida East X-Coordinate	Florida East Y- Coordinate	Nodal Z-Coordinate	Pumping Max Rate, cfd	Computed Pressure Head, ft
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-32.004	-163636.	-45.2713
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-38.277	-163636.	-38.6626
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-44.551	-163636.	-32.1624
Pahokee_Cluster_RW-1-2-3_combo	767437.0	906262.0	16.547	-48129.	-6666.1740
Pahokee_Cluster_RW-1-2-3_combo	767437.0	906262.0	13.784	-48129.	-6646.6513
Pahokee_Cluster_RW-1-2-3_combo	767437.0	906262.0	11.022	-48129.	-6630.6105
Pahokee_Cluster_RW-1-2-3_combo	767437.0	906262.0	3.721	-48129.	-3971.7295
Ridgdill_and_Son_Pump1	686080.0	870502.0	-4.338	-866310.	-2487.1689
Ridgdill_and_Son_Pump1	686080.0	870502.0	-13.439	-866310.	-2109.2063
Ridgdill_and_Son_Pump2	686080.0	870197.0	-4.055	-866310.	-2492.4567
Ridgdill_and_Son_Pump2	686080.0	870197.0	-13.326	-866310.	-2068.9532
SuperStop_1-2-3-4-combo	680966.0	879858.0	14.122	-5776.	-21.0032
SuperStop_1-2-3-4-combo	680966.0	879858.0	10.798	-5776.	-17.0573
US_Sugar_Main_combo(275_276)	677297.0	879942.0	-41.779	-134759.	-17.2301
Run 84 (w/ Project): identical dry wells					

Table G20. List of the 60 nodal locations where dewatering occurred at pump wells for Run 37 and Run 85 (w/ project).

Run 37 (w/o project) Dry Well Name	Florida East X-Coordinate	Florida East Y- Coordinate	Nodal Z-Coordinate	Pumping Max Rate, cfd	Computed Pressure Head, ft
Clewiston_Fld_AT_S-2_1	689144.0	872904.0	14.708	-15401.	-22.2999
Clewiston_Fld_AT_S-2_1	689144.0	872904.0	12.255	-15401.	-19.6974
Clewiston_Fld_AT_S-2_1	689144.0	872904.0	6.735	-15401.	-13.9468
Clewiston_Fld_AT_S-2_1	689144.0	872904.0	1.214	-15401.	-8.3339
DupuisReserve_5(remove)	794677.0	969277.0	19.308	-1155.	-12.8268
DupuisReserve_5(remove)	794677.0	969277.0	18.198	-1155.	-11.6809
DupuisReserve_5(remove)	794677.0	969277.0	17.088	-1155.	-10.5287
DupuisReserve_5(remove)	794677.0	969277.0	10.912	-1155.	-2.8920
DupuisReserve_3(remove)	793111.0	968159.0	17.798	-1925.	-11.5321
DupuisReserve_3(remove)	793111.0	968159.0	16.354	-1925.	-10.0376
DupuisReserve_3(remove)	793111.0	968159.0	10.642	-1925.	-3.1715
DupuisReserve_4(remove)	796413.0	969856.0	19.038	-1925.	-11.9428
DupuisReserve_4(remove)	796413.0	969856.0	17.886	-1925.	-10.7544
DupuisReserve_4(remove)	796413.0	969856.0	11.195	-1925.	-2.8144
DupuisReserve_5	793243.0	967580.0	18.922	-1925.	-14.6395
DupuisReserve_5	793243.0	967580.0	16.351	-1925.	-11.9221
DupuisReserve_5	793243.0	967580.0	10.623	-1925.	-4.2952
DupuisReserve_2	799833.0	970908.0	21.282	-3850.	-13.4932
DupuisReserve_2	799833.0	970908.0	19.490	-3850.	-11.6612
DupuisReserve_2	799833.0	970908.0	11.739	-3850.	-3.0066
DupuisReserve_3	794927.0	969185.0	20.076	-3850.	-17.0589
DupuisReserve_3	794927.0	969185.0	18.629	-3850.	-15.4368
DupuisReserve_3	794927.0	969185.0	17.182	-3850.	-13.7923
DupuisReserve_3	794927.0	969185.0	10.942	-3850.	-4.3807
DupuisReserve_1	799478.0	971605.0	21.032	-6353.	-14.3597
DupuisReserve_1	799478.0	971605.0	19.421	-6353.	-12.6902

Run 37 (w/o project) Dry Well Name	Florida East X-Coordinate	Florida East Y- Coordinate	Nodal Z-Coordinate	Pumping Max Rate, cfd	Computed Pressure Head, ft
DupuisReserve_1	799478.0	971605.0	11.750	-6353.	-3.3365
DupuisReserve_4	795045.0	969250.0	18.737	-6738.	-36.5195
DupuisReserve_4	795045.0	969250.0	17.240	-6738.	-33.9192
DupuisReserve_4	795045.0	969250.0	10.963	-6738.	-8.6453
DupuisReserve_8	793546.0	967422.0	19.214	-15401.	-156.1089
DupuisReserve_8	793546.0	967422.0	16.456	-15401.	-147.0675
DupuisReserve_8	793546.0	967422.0	10.651	-15401.	-31.2515
Farm	661437.0	878143.0	13.398	-144385.	-21.3036
Farm	661437.0	878143.0	12.896	-144385.	-20.6126
Farm	661437.0	878143.0	12.395	-144385.	-19.6357
Farm	661437.0	878143.0	-1.151	-144385.	-4.9136
JJ_Wiggins_Youth	617741.0	908330.0	-82.059	-11551.	-55.4828
Lake_Pt_LLC_Prop_P-4	790078.0	961014.0	-5.739	-192513.	-4.1041
Lake_Pt_LLC_Prop_P-5	790760.0	960177.0	-5.625	-192513.	-4.4699
LipsickSand_combo_180-181-182	618604.0	909069.0	-15.779	-1540107.	-4364.5124
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-20.004	-163636.	-173.8924
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-21.004	-163636.	-172.8007
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-22.004	-163636.	-171.7295
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-27.004	-163636.	-150.4321
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-32.004	-163636.	-124.8357
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-38.277	-163636.	-90.0338
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-44.551	-163636.	-57.7232
Moore_Haven_Plant_Well-1	620786.0	904442.0	-6.367	-9626.	-1.2619
Pahokee_Cluster_RW-1-2-3_combo	767437.0	906262.0	16.547	-48129.	-2082.6067
Pahokee_Cluster_RW-1-2-3_combo	767437.0	906262.0	13.784	-48129.	-2055.5511
Pahokee_Cluster_RW-1-2-3_combo	767437.0	906262.0	11.022	-48129.	-2014.2470
Pahokee_Cluster_RW-1-2-3_combo	767437.0	906262.0	3.721	-48129.	-1025.4871

Run 37 (w/o project) Dry Well Name	Florida East X-Coordinate	Florida East Y- Coordinate	Nodal Z-Coordinate	Pumping Max Rate, cfd	Computed Pressure Head, ft
Ridgdill_and_Son_Pump1	686080.0	870502.0	-4.338	-866310.	-587.8874
Ridgdill_and_Son_Pump1	686080.0	870502.0	-13.439	-866310.	-501.2616
Ridgdill_and_Son_Pump2	686080.0	870197.0	-4.055	-866310.	-584.8946
Ridgdill_and_Son_Pump2	686080.0	870197.0	-13.326	-866310.	-490.3329
SuperStop_1-2-3-4-combo	680966.0	879858.0	14.122	-5776.	-17.3918
SuperStop_1-2-3-4-combo	680966.0	879858.0	10.798	-5776.	-13.5933
US_Sugar_Main_combo(275_276)	677297.0	879942.0	-41.779	-134759.	-13.4457
Run 85 (w/ Project): identical dry wells					

Table G21. List of the 72 nodal locations where dewatering occurred at pump wells for Run 38 and Run 86 (w/ project).

Run 38 (w/o project) Dry Well Name	Florida East X-Coordinate	Florida East Y- Coordinate	Nodal Z-Coordinate	Pumping Max Rate, cfd	Computed Pressure Head, ft
Booker_Park_Combo_38-39-40	824572.0	977629.0	-2.482	-26952.	-1.7202
Clewiston_Fld_AT_S-2_1	689144.0	872904.0	14.708	-15401.	-29.7699
Clewiston_Fld_AT_S-2_1	689144.0	872904.0	12.255	-15401.	-27.1677
Clewiston_Fld_AT_S-2_1	689144.0	872904.0	6.735	-15401.	-21.4077
Clewiston_Fld_AT_S-2_1	689144.0	872904.0	1.214	-15401.	-15.5776
Clewiston_Fld_AT_S-2_1	689144.0	872904.0	-10.648	-15401.	-3.5583
DupuisReserve_5(remove)	794677.0	969277.0	19.308	-1155.	-16.0528
DupuisReserve_5(remove)	794677.0	969277.0	18.198	-1155.	-14.8441
DupuisReserve_5(remove)	794677.0	969277.0	17.088	-1155.	-13.6589
DupuisReserve_5(remove)	794677.0	969277.0	10.912	-1155.	-5.5135
DupuisReserve_3(remove)	793111.0	968159.0	17.798	-1925.	-15.7591
DupuisReserve_3(remove)	793111.0	968159.0	16.354	-1925.	-14.1994
DupuisReserve_3(remove)	793111.0	968159.0	10.642	-1925.	-6.7281
DupuisReserve_3(remove)	793111.0	968159.0	4.929	-1925.	-0.0156
DupuisReserve_4(remove)	796413.0	969856.0	19.038	-1925.	-14.6845
DupuisReserve_4(remove)	796413.0	969856.0	17.886	-1925.	-13.4732
DupuisReserve_4(remove)	796413.0	969856.0	11.195	-1925.	-5.1757
DupuisReserve_5	793243.0	967580.0	18.922	-1925.	-22.6118
DupuisReserve_5	793243.0	967580.0	16.351	-1925.	-19.6464
DupuisReserve_5	793243.0	967580.0	10.623	-1925.	-10.3263
DupuisReserve_5	793243.0	967580.0	4.895	-1925.	-2.6357
DupuisReserve_2	799833.0	970908.0	21.282	-3850.	-16.6515
DupuisReserve_2	799833.0	970908.0	19.490	-3850.	-14.7722
DupuisReserve_2	799833.0	970908.0	11.739	-3850.	-5.7870
DupuisReserve_3	794927.0	969185.0	20.076	-3850.	-24.4508
DupuisReserve_3	794927.0	969185.0	18.629	-3850.	-22.7501

Run 38 (w/o project) Dry Well Name	Florida East X-Coordinate	Florida East Y- Coordinate	Nodal Z-Coordinate	Pumping Max Rate, cfd	Computed Pressure Head, ft
DupuisReserve_3	794927.0	969185.0	17.182	-3850.	-20.9097
DupuisReserve_3	794927.0	969185.0	10.942	-3850.	-8.5141
DupuisReserve_1	799478.0	971605.0	21.032	-6353.	-17.7012
DupuisReserve_1	799478.0	971605.0	19.421	-6353.	-15.9660
DupuisReserve_1	799478.0	971605.0	11.750	-6353.	-6.0461
DupuisReserve_4	795045.0	969250.0	18.737	-6738.	-65.6283
DupuisReserve_4	795045.0	969250.0	17.240	-6738.	-62.9557
DupuisReserve_4	795045.0	969250.0	10.963	-6738.	-14.4440
DupuisReserve_4	795045.0	969250.0	4.687	-6738.	-0.1086
DupuisReserve_8	793546.0	967422.0	19.214	-15401.	-232.6503
DupuisReserve_8	793546.0	967422.0	16.456	-15401.	-223.9942
DupuisReserve_8	793546.0	967422.0	10.651	-15401.	-110.7478
DupuisReserve_8	793546.0	967422.0	4.845	-15401.	-5.7504
Farm	661437.0	878143.0	13.398	-144385.	-31.1146
Farm	661437.0	878143.0	12.896	-144385.	-30.4098
Farm	661437.0	878143.0	12.395	-144385.	-29.3952
Farm	661437.0	878143.0	-1.151	-144385.	-13.4841
Glades_Sugar_NWSW_SWSW-combo	770626.0	862409.0	-5.216	-154010.	-1.3179
IndTwn_combo(139_140_141_142)	828167.0	977223.0	-55.067	-115508.	-6.5048
JJ_Wiggins_Youth	617741.0	908330.0	-82.059	-11551.	-178.6563
Lake_Pt_LLC_Prop_P-3	787270.0	961014.0	-6.809	-192513.	-242.9451
Lake_Pt_LLC_Prop_P-3	787270.0	961014.0	-18.569	-192513.	-266.6306
Lake_Pt_LLC_Prop_P-4	790078.0	961014.0	-5.739	-192513.	-254.2740
Lake_Pt_LLC_Prop_P-4	790078.0	961014.0	-16.032	-192513.	-251.9348
Lake_Pt_LLC_Prop_P-5	790760.0	960177.0	-5.625	-192513.	-247.7226
Lake_Pt_LLC_Prop_P-5	790760.0	960177.0	-15.516	-192513.	-244.1939
LipsickSand_combo_180-181-182	618604.0	909069.0	-15.779	-1540107.	-9997.3158

Run 38 (w/o project) Dry Well Name	Florida East X-Coordinate	Florida East Y- Coordinate	Nodal Z-Coordinate	Pumping Max Rate, cfd	Computed Pressure Head, ft
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-20.004	-163636.	-347.0026
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-21.004	-163636.	-345.5531
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-22.004	-163636.	-344.0651
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-27.004	-163636.	-316.6817
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-32.004	-163636.	-285.1813
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-38.277	-163636.	-243.4070
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-44.551	-163636.	-200.9352
Moore_Haven_Plant_Well-1	620786.0	904442.0	-6.367	-9626.	-9.0365
Pahokee_Cluster_RW-1-2-3_combo	767437.0	906262.0	16.547	-48129.	-2090.6330
Pahokee_Cluster_RW-1-2-3_combo	767437.0	906262.0	13.784	-48129.	-2063.4418
Pahokee_Cluster_RW-1-2-3_combo	767437.0	906262.0	11.022	-48129.	-2022.1088
Pahokee_Cluster_RW-1-2-3_combo	767437.0	906262.0	3.721	-48129.	-1034.2063
Ridgdill_and_Son_Pump1	686080.0	870502.0	-4.338	-866310.	-2602.4718
Ridgdill_and_Son_Pump1	686080.0	870502.0	-13.439	-866310.	-2242.4764
Ridgdill_and_Son_Pump2	686080.0	870197.0	-4.055	-866310.	-2604.4671
Ridgdill_and_Son_Pump2	686080.0	870197.0	-13.326	-866310.	-2198.1734
SuperStop_1-2-3-4-combo	680966.0	879858.0	14.122	-5776.	-22.2184
SuperStop_1-2-3-4-combo	680966.0	879858.0	10.798	-5776.	-18.2728
US_Sugar_Main_combo(275_276)	677297.0	879942.0	-41.779	-134759.	-24.0238
Run 86 (w/ Project): identical dry wells					

Table G22. List of the 61 nodal locations where dewatering occurred at pump wells for Run 39 and Run 87 (w/ project).

Run 39 (w/o project) Dry Well Name	Florida East X-Coordinate	Florida East Y- Coordinate	Nodal Z-Coordinate	Pumping Max Rate, cfd	Computed Pressure Head, ft
Clewiston_Fld_AT_S-2_1	689144.0	872904.0	14.708	-15401.	-22.9747
Clewiston_Fld_AT_S-2_1	689144.0	872904.0	12.255	-15401.	-20.3722
Clewiston_Fld_AT_S-2_1	689144.0	872904.0	6.735	-15401.	-14.6131
Clewiston_Fld_AT_S-2_1	689144.0	872904.0	1.214	-15401.	-8.9880
DupuisReserve_5(remove)	794677.0	969277.0	19.308	-1155.	-37.7727
DupuisReserve_5(remove)	794677.0	969277.0	18.198	-1155.	-36.5589
DupuisReserve_5(remove)	794677.0	969277.0	17.088	-1155.	-35.3712
DupuisReserve_5(remove)	794677.0	969277.0	10.912	-1155.	-6.7607
DupuisReserve_3(remove)	793111.0	968159.0	17.798	-1925.	-66.3235
DupuisReserve_3(remove)	793111.0	968159.0	16.354	-1925.	-64.7190
DupuisReserve_3(remove)	793111.0	968159.0	10.642	-1925.	-12.2046
DupuisReserve_4(remove)	796413.0	969856.0	19.038	-1925.	-69.7446
DupuisReserve_4(remove)	796413.0	969856.0	17.886	-1925.	-68.4848
DupuisReserve_4(remove)	796413.0	969856.0	11.195	-1925.	-11.6412
DupuisReserve_5	793243.0	967580.0	18.922	-1925.	-49.0996
DupuisReserve_5	793243.0	967580.0	16.351	-1925.	-46.2998
DupuisReserve_5	793243.0	967580.0	10.623	-1925.	-10.8527
DupuisReserve_2	799833.0	970908.0	21.282	-3850.	-36.9448
DupuisReserve_2	799833.0	970908.0	19.490	-3850.	-35.0614
DupuisReserve_2	799833.0	970908.0	11.739	-3850.	-8.7969
DupuisReserve_3	794927.0	969185.0	20.076	-3850.	-245.5312
DupuisReserve_3	794927.0	969185.0	18.629	-3850.	-243.8267
DupuisReserve_3	794927.0	969185.0	17.182	-3850.	-241.9664
DupuisReserve_3	794927.0	969185.0	10.942	-3850.	-66.5422
DupuisReserve_1	799478.0	971605.0	21.032	-6353.	-90.2820
DupuisReserve_1	799478.0	971605.0	19.421	-6353.	-88.5374

Run 39 (w/o project) Dry Well Name	Florida East X-Coordinate	Florida East Y- Coordinate	Nodal Z-Coordinate	Pumping Max Rate, cfd	Computed Pressure Head, ft
DupuisReserve_1	799478.0	971605.0	11.750	-6353.	-14.9503
DupuisReserve_4	795045.0	969250.0	18.737	-6738.	-501.7365
DupuisReserve_4	795045.0	969250.0	17.240	-6738.	-499.5971
DupuisReserve_4	795045.0	969250.0	10.963	-6738.	-264.8521
DupuisReserve_8	793546.0	967422.0	19.214	-15401.	-795.7374
DupuisReserve_8	793546.0	967422.0	16.456	-15401.	-790.4975
DupuisReserve_8	793546.0	967422.0	10.651	-15401.	-486.1534
Farm	661437.0	878143.0	13.398	-144385.	-21.4825
Farm	661437.0	878143.0	12.896	-144385.	-20.7904
Farm	661437.0	878143.0	12.395	-144385.	-19.8108
Farm	661437.0	878143.0	-1.151	-144385.	-5.0627
JJ_Wiggins_Youth	617741.0	908330.0	-82.059	-11551.	-56.1570
Lake_Pt_LLC_Prop_P-3	787270.0	961014.0	-6.809	-192513.	-0.4245
Lake_Pt_LLC_Prop_P-4	790078.0	961014.0	-5.739	-192513.	-5.7339
Lake_Pt_LLC_Prop_P-5	790760.0	960177.0	-5.625	-192513.	-5.9354
LipsickSand_combo_180-181-182	618604.0	909069.0	-15.779	-1540107.	-4365.6902
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-20.004	-163636.	-174.1000
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-21.004	-163636.	-173.0083
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-22.004	-163636.	-171.9370
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-27.004	-163636.	-150.6478
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-32.004	-163636.	-125.0587
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-38.277	-163636.	-90.2666
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-44.551	-163636.	-57.8937
Moore_Haven_Plant_Well-1	620786.0	904442.0	-6.367	-9626.	-1.3354
Pahokee_Cluster_RW-1-2-3_combo	767437.0	906262.0	16.547	-48129.	-6663.9980
Pahokee_Cluster_RW-1-2-3_combo	767437.0	906262.0	13.784	-48129.	-6644.4779
Pahokee_Cluster_RW-1-2-3_combo	767437.0	906262.0	11.022	-48129.	-6628.4404

Run 39 (w/o project) Dry Well Name	Florida East X-Coordinate	Florida East Y- Coordinate	Nodal Z-Coordinate	Pumping Max Rate, cfd	Computed Pressure Head, ft
Pahokee_Cluster_RW-1-2-3_combo	767437.0	906262.0	3.721	-48129.	-3970.0568
Ridgdill_and_Son_Pump1	686080.0	870502.0	-4.338	-866310.	-590.7176
Ridgdill_and_Son_Pump1	686080.0	870502.0	-13.439	-866310.	-504.0882
Ridgdill_and_Son_Pump2	686080.0	870197.0	-4.055	-866310.	-587.6956
Ridgdill_and_Son_Pump2	686080.0	870197.0	-13.326	-866310.	-493.1303
SuperStop_1-2-3-4-combo	680966.0	879858.0	14.122	-5776.	-17.8994
SuperStop_1-2-3-4-combo	680966.0	879858.0	10.798	-5776.	-14.0452
US_Sugar_Main_combo(275_276)	677297.0	879942.0	-41.779	-134759.	-13.7949
Run 87 (w/ Project): identical dry wells					

Table G23. List of the 76 nodal locations where dewatering occurred at pump wells for Run 40 and Run 88 (w/ project).

Run 40 (w/o project) Dry Well Name	Florida East X-Coordinate	Florida East Y- Coordinate	Nodal Z-Coordinate	Pumping Max Rate, cfd	Computed Pressure Head, ft
Booker_Park_Combo_38-39-40	824572.0	977629.0	-2.482	-26952.	-2.3988
Clewiston_Fld_AT_S-2_1	689144.0	872904.0	14.708	-15401.	-30.3103
Clewiston_Fld_AT_S-2_1	689144.0	872904.0	12.255	-15401.	-27.7082
Clewiston_Fld_AT_S-2_1	689144.0	872904.0	6.735	-15401.	-21.9481
Clewiston_Fld_AT_S-2_1	689144.0	872904.0	1.214	-15401.	-16.1163
Clewiston_Fld_AT_S-2_1	689144.0	872904.0	-10.648	-15401.	-4.0837
DupuisReserve_5(remove)	794677.0	969277.0	19.308	-1155.	-71.4254
DupuisReserve_5(remove)	794677.0	969277.0	18.198	-1155.	-70.2001
DupuisReserve_5(remove)	794677.0	969277.0	17.088	-1155.	-69.0018
DupuisReserve_5(remove)	794677.0	969277.0	10.912	-1155.	-19.4173
DupuisReserve_5(remove)	794677.0	969277.0	4.737	-1155.	-3.0519
DupuisReserve_3(remove)	793111.0	968159.0	17.798	-1925.	-94.5681
DupuisReserve_3(remove)	793111.0	968159.0	16.354	-1925.	-92.9647
DupuisReserve_3(remove)	793111.0	968159.0	10.642	-1925.	-34.0728
DupuisReserve_3(remove)	793111.0	968159.0	4.929	-1925.	-5.4633
DupuisReserve_4(remove)	796413.0	969856.0	19.038	-1925.	-89.2743
DupuisReserve_4(remove)	796413.0	969856.0	17.886	-1925.	-88.0157
DupuisReserve_4(remove)	796413.0	969856.0	11.195	-1925.	-24.8956
DupuisReserve_4(remove)	796413.0	969856.0	4.504	-1925.	-1.1701
DupuisReserve_5	793243.0	967580.0	18.922	-1925.	-82.8231
DupuisReserve_5	793243.0	967580.0	16.351	-1925.	-80.0345
DupuisReserve_5	793243.0	967580.0	10.623	-1925.	-41.6201
DupuisReserve_5	793243.0	967580.0	4.895	-1925.	-7.9428
DupuisReserve_2	799833.0	970908.0	21.282	-3850.	-66.2534
DupuisReserve_2	799833.0	970908.0	19.490	-3850.	-64.3624
DupuisReserve_2	799833.0	970908.0	11.739	-3850.	-16.1203

Run 40 (w/o project) Dry Well Name	Florida East X-Coordinate	Florida East Y- Coordinate	Nodal Z-Coordinate	Pumping Max Rate, cfd	Computed Pressure Head, ft
DupuisReserve_3	794927.0	969185.0	20.076	-3850.	-320.4561
DupuisReserve_3	794927.0	969185.0	18.629	-3850.	-318.7619
DupuisReserve_3	794927.0	969185.0	17.182	-3850.	-316.9349
DupuisReserve_3	794927.0	969185.0	10.942	-3850.	-161.2741
DupuisReserve_3	794927.0	969185.0	4.702	-3850.	-4.3114
DupuisReserve_1	799478.0	971605.0	21.032	-6353.	-110.4501
DupuisReserve_1	799478.0	971605.0	19.421	-6353.	-108.7071
DupuisReserve_1	799478.0	971605.0	11.750	-6353.	-28.7281
DupuisReserve_4	795045.0	969250.0	18.737	-6738.	-541.3606
DupuisReserve_4	795045.0	969250.0	17.240	-6738.	-539.2104
DupuisReserve_4	795045.0	969250.0	10.963	-6738.	-303.3419
DupuisReserve_4	795045.0	969250.0	4.687	-6738.	-4.3534
DupuisReserve_8	793546.0	967422.0	19.214	-15401.	-829.3995
DupuisReserve_8	793546.0	967422.0	16.456	-15401.	-824.0496
DupuisReserve_8	793546.0	967422.0	10.651	-15401.	-501.5400
DupuisReserve_8	793546.0	967422.0	4.845	-15401.	-10.5127
DupuisReserve_8	793546.0	967422.0	-3.211	-15401.	-2.1351
Farm	661437.0	878143.0	13.398	-144385.	-31.2772
Farm	661437.0	878143.0	12.896	-144385.	-30.5718
Farm	661437.0	878143.0	12.395	-144385.	-29.5557
Farm	661437.0	878143.0	-1.151	-144385.	-13.6009
Glades_Sugar_NWSW_SWSW-combo	770626.0	862409.0	-5.216	-154010.	-3.3396
IndTwn_combo(139_140_141_142)	828167.0	977223.0	-55.067	-115508.	-7.3394
JJ_Wiggins_Youth	617741.0	908330.0	-82.059	-11551.	-179.1041
Lake_Pt_LLC_Prop_P-3	787270.0	961014.0	-6.809	-192513.	-255.1595
Lake_Pt_LLC_Prop_P-3	787270.0	961014.0	-18.569	-192513.	-279.2767
Lake_Pt_LLC_Prop_P-4	790078.0	961014.0	-5.739	-192513.	-268.8238

Run 40 (w/o project) Dry Well Name	Florida East X-Coordinate	Florida East Y- Coordinate	Nodal Z-Coordinate	Pumping Max Rate, cfd	Computed Pressure Head, ft
Lake_Pt_LLC_Prop_P-4	790078.0	961014.0	-16.032	-192513.	-266.6211
Lake_Pt_LLC_Prop_P-5	790760.0	960177.0	-5.625	-192513.	-267.6062
Lake_Pt_LLC_Prop_P-5	790760.0	960177.0	-15.516	-192513.	-264.7424
LipsickSand_combo_180-181-182	618604.0	909069.0	-15.779	-1540107.	-9998.7571
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-20.004	-163636.	-347.1410
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-21.004	-163636.	-345.6916
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-22.004	-163636.	-344.2036
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-27.004	-163636.	-316.8190
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-32.004	-163636.	-285.3171
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-38.277	-163636.	-243.5420
Lundy_Presley_Citrus_WELL_1	617440.0	907355.0	-44.551	-163636.	-201.0711
Moore_Haven_Plant_Well-1	620786.0	904442.0	-6.367	-9626.	-9.1030
Pahokee_Cluster_RW-1-2-3_combo	767437.0	906262.0	16.547	-48129.	-6688.5047
Pahokee_Cluster_RW-1-2-3_combo	767437.0	906262.0	13.784	-48129.	-6668.9493
Pahokee_Cluster_RW-1-2-3_combo	767437.0	906262.0	11.022	-48129.	-6652.8261
Pahokee_Cluster_RW-1-2-3_combo	767437.0	906262.0	3.721	-48129.	-3973.3278
Ridgdill_and_Son_Pump1	686080.0	870502.0	-4.338	-866310.	-2604.4747
Ridgdill_and_Son_Pump1	686080.0	870502.0	-13.439	-866310.	-2244.4815
Ridgdill_and_Son_Pump2	686080.0	870197.0	-4.055	-866310.	-2606.7590
Ridgdill_and_Son_Pump2	686080.0	870197.0	-13.326	-866310.	-2200.4683
SuperStop_1-2-3-4-combo	680966.0	879858.0	14.122	-5776.	-22.5321
SuperStop_1-2-3-4-combo	680966.0	879858.0	10.798	-5776.	-18.5861
US_Sugar_Main_combo(275_276)	677297.0	879942.0	-41.779	-134759.	-24.4828
Run 88 (w/ Project): identical dry wells					

Table G24. Approximate minimum and maximum distances (in ft) from the HHD to various head differential values in Reach 1A (for Table F3).

ID*	Pressure Head Comparison (w/ project - w/o project)	Head Diff ≥ 0.1 ft		Head Diff ≥ 0.5 ft		Head Diff ≥ 1.0 ft		Head Diff ≥ 2.0 ft	
		Distance Min	Distance Max	Distance Min	Distance Max	Distance Min	Distance Max	Distance Min	Distance Max
1	Run65 - Run17	1300	12700	0	2200	0	0	0	0
2	Run66 - Run18	0	9300	0	500	0	0	0	0
3	Run67 - Run19	1500	15700	0	13700/1800	0	13700/0	0	0
4	Run68 - Run20	0	13700/9600	0	600	0	0	0	0
5	Run69 - Run21	3200	27200	1000	13700/9700	0	4700	0	500
6	Run70 - Run22	900	16000	0	9400	0	8300/1600	0	100
7	Run71 - Run23	6800	34500	500	13700/11500	0	13700/4800	0	13700/600
8	Run72 - Run24	600	18000	0	9200	0	8700/1900	0	8700/0

Table G25. Approximate minimum and maximum distances (in ft) from the HHD to various head differential values in Reach 1B (for Table F3).

ID*	Pressure Head Comparison (w/ project - w/o project)	Head Diff ≥ 0.1 ft		Head Diff ≥ 0.5 ft		Head Diff ≥ 1.0 ft		Head Diff ≥ 2.0 ft	
		Distance Min	Distance Max	Distance Min	Distance Max	Distance Min	Distance Max	Distance Min	Distance Max
1	Run65 - Run17	2800	4300	0	600	0	0	0	0
2	Run66 - Run18	100	1000	0	0	0	0	0	0
3	Run67 - Run19	800	4000	0	50	0	0	0	0
4	Run68 - Run20	0	100	0	0	0	0	0	0
5	Run69 - Run21	4300	8600	1000	1900	0	400	0	0
6	Run70 - Run22	800	1800	0	100	0	0	0	0
7	Run71 - Run23	6300	11500	0	500	0	0	0	0
8	Run72 - Run24	600	700	0	0	0	0	0	0

Table G26. Approximate minimum and maximum distances (in ft) from the HHD to various head differential values in Reach 1C (for Table F3).

ID*	Pressure Head Comparison (w/ project - w/o project)	Head Diff ≥ 0.1 ft		Head Diff ≥ 0.5 ft		Head Diff ≥ 1.0 ft		Head Diff ≥ 2.0 ft	
		Distance Min	Distance Max	Distance Min	Distance Max	Distance Min	Distance Max	Distance Min	Distance Max
1	Run65 - Run17	0	3700	0	0	0	0	0	0
2	Run66 - Run18	0	200	0	0	0	0	0	0
3	Run67 - Run19	0	1000	0	0	0	0	0	0
4	Run68 - Run20	0	1000	0	0	0	0	0	0
5	Run69 - Run21	11200	30000	1000	9200	0	900	0	0
6	Run70 - Run22	800	10000	0	500	0	200	0	0
7	Run71 - Run23	13000	30000	50	6400	0	1200/200	0	1200/0
8	Run72 - Run24	600	7200	0	1200	0	1200/200	0	1200/0

Table G27. Approximate minimum and maximum distances (in ft) from the HHD to various head differential values in Reach 1D (for Table F3).

ID*	Pressure Head Comparison (w/ project - w/o project)	Head Diff ≥ 0.1 ft		Head Diff ≥ 0.5 ft		Head Diff ≥ 1.0 ft		Head Diff ≥ 2.0 ft	
		Distance Min	Distance Max	Distance Min	Distance Max	Distance Min	Distance Max	Distance Min	Distance Max
1	Run65 - Run17	0	3600	0	0	0	0	0	0
2	Run66 - Run18	0	100	0	0	0	0	0	0
3	Run67 - Run19	0	2000	0	50	0	0	0	0
4	Run68 - Run20	0	200	0	0	0	0	0	0
5	Run69 - Run21	28500	38000	2700	15500	0	7000	0	650
6	Run70 - Run22	2700	16500	0	2500	0	250	0	0
7	Run71 - Run23	34000	49000	5200	21500	0	6500	0	0
8	Run72 - Run24	3500	24000	0	2200	0	250	0	0

Table G28. Approximate minimum and maximum distances (in ft) from the HHD to various head differential values in Reach 2 (for Table F3).

ID*	Pressure Head Comparison (w/ project - w/o project)	Head Diff ≥ 0.1 ft		Head Diff ≥ 0.5 ft		Head Diff ≥ 1.0 ft		Head Diff ≥ 2.0 ft	
		Distance Min	Distance Max	Distance Min	Distance Max	Distance Min	Distance Max	Distance Min	Distance Max
1	Run65 - Run17	0	27500	0	9200/7300	0	9200/1400	0	**9200/0**
2	Run66 - Run18	0	9200/4500	0	100	0	0	0	**0**
3	Run67 - Run19	0	29500	0	9200/1300	0	9200/1300	0	**9200/0**
4	Run68 - Run20	0	9200/4800	0	100	0	0	0	**0**
5	Run69 - Run21	7400	35000	600	15000	0	9200/5800	0	**9200/800**
6	Run70 - Run22	200	14000	0	9200/600	0	100	0	**0**
7	Run71 - Run23	5400	36000	0	14500	0	9200/5800	0	**9200/800**
8	Run72 - Run24	**200**	**11000**	**0**	**9200/600**	**0**	**9200/100**	**0**	**9200/0**

Table G29. Approximate minimum and maximum distances (in ft) from the HHD to various head differential values in Reach 3 (for Table F3).

ID*	Pressure Head Comparison (w/ project - w/o project)	Head Diff ≥ 0.1 ft		Head Diff ≥ 0.5 ft		Head Diff ≥ 1.0 ft		Head Diff ≥ 2.0 ft	
		Distance Min	Distance Max	Distance Min	Distance Max	Distance Min	Distance Max	Distance Min	Distance Max
1	Run65 - Run17	0	4700	0	0	0	0	0	**0**
2	Run66 - Run18	0	100	0	0	0	0	0	**0**
3	Run67 - Run19	0	2600	0	100	0	0	0	**0**
4	Run68 - Run20	0	150	0	50	0	0	0	**0**
5	Run69 - Run21	1200	28000	1500	9500	0	4500	0	**800**
6	Run70 - Run22	800	9300	0	2500	0	300	0	**0**
7	Run71 - Run23	7500	42000	0	17800	0	5400	0	**50**
8	Run72 - Run24	**200**	**20100**	**0**	**2000**	**0**	**150**	**0**	**0**

Table G30. Approximate minimum and maximum distances (in ft) from the HHD to various head differential values in Reach 1A (for Table F5).

ID*	Pressure Head Comparison (w/ project - w/o project)	Head Diff ≥ 0.1 ft		Head Diff ≥ 0.5 ft		Head Diff ≥ 1.0 ft		Head Diff ≥ 2.0 ft	
		Distance Min	Distance Max	Distance Min	Distance Max	Distance Min	Distance Max	Distance Min	Distance Max
1	Run81 - Run33	0	13700/10400	0	500	0	0	0	0
2	Run82 - Run34	0	8700/6500	0	0	0	0	0	0
3	Run83 - Run35	0	13700/12800	0	500	0	0	0	0
4	Run84 - Run36	0	9500	0	50	0	0	0	0
5	Run85 - Run37	1200	24500	0	13700/8400	0	2600	0	0
6	Run86 - Run38	0	13500	0	8850/3100	0	5700/700	0	0
7	Run87 - Run39	3200	31100	0	13700/9500	0	13700/3500	0	13700/0
8	Run88 - Run40	0	15700	0	9100	0	8500/200	0	0

Table G31. Approximate minimum and maximum distances (in ft) from the HHD to various head differential values in Reach 1B (for Table F5).

ID*	Pressure Head Comparison (w/ project - w/o project)	Head Diff ≥ 0.1 ft		Head Diff ≥ 0.5 ft		Head Diff ≥ 1.0 ft		Head Diff ≥ 2.0 ft	
		Distance Min	Distance Max	Distance Min	Distance Max	Distance Min	Distance Max	Distance Min	Distance Max
1	Run81 - Run33	0	300	0	0	0	0	0	0
2	Run82 - Run34	0	0	0	0	0	0	0	0
3	Run83 - Run35	0	0	0	0	0	0	0	0
4	Run84 - Run36	0	0	0	0	0	0	0	0
5	Run85 - Run37	1500	1600	0	0	0	0	0	0
6	Run86 - Run38	0	100	0	0	0	0	0	0
7	Run87 - Run39	400	4300	0	0	0	0	0	0
8	Run88 - Run40	0	50	0	0	0	0	0	0

Table G32. Approximate minimum and maximum distances (in ft) from the HHD to various head differential values in Reach 1C (for Table F5).

ID*	Pressure Head Comparison (w/ project - w/o project)	Head Diff ≥ 0.1 ft		Head Diff ≥ 0.5 ft		Head Diff ≥ 1.0 ft		Head Diff ≥ 2.0 ft	
		Distance Min	Distance Max	Distance Min	Distance Max	Distance Min	Distance Max	Distance Min	Distance Max
1	Run81 - Run33	0	0	0	0	0	0	0	0
2	Run82 - Run34	0	0	0	0	0	0	0	0
3	Run83 - Run35	0	1000/0	0	0	0	0	0	0
4	Run84 - Run36	0	0	0	0	0	0	0	0
5	Run85 - Run37	1900	13300	0	1000/500	0	0	0	0
6	Run86 - Run38	0	1350	0	100	0	0	0	0
7	Run87 - Run39	700	13600	0	1000/800	0	1000/0	0	1000/0
8	Run88 - Run40	0	1000	0	1000/100	0	0	0	0

Table G33. Approximate minimum and maximum distances (in ft) from the HHD to various head differential values in Reach 1D (for Table F5).

ID*	Pressure Head Comparison (w/ project - w/o project)	Head Diff ≥ 0.1 ft		Head Diff ≥ 0.5 ft		Head Diff ≥ 1.0 ft		Head Diff ≥ 2.0 ft	
		Distance Min	Distance Max	Distance Min	Distance Max	Distance Min	Distance Max	Distance Min	Distance Max
1	Run81 - Run33	0	0	0	0	0	0	0	0
2	Run82 - Run34	0	0	0	0	0	0	0	0
3	Run83 - Run35	0	0	0	0	0	0	0	0
4	Run84 - Run36	0	0	0	0	0	0	0	0
5	Run85 - Run37	0	15800	0	0	0	0	0	0
6	Run86 - Run38	0	300	0	0	0	0	0	0
7	Run87 - Run39	0	21500	0	100	0	0	0	0
8	Run88 - Run40	0	1500	0	0	0	0	0	0

Table G34. Approximate minimum and maximum distances (in ft) from the HHD to various head differential values in Reach 2 (for Table F5).

ID*	Pressure Head Comparison (w/ project - w/o project)	Head Diff > 0.1 ft		Head Diff > 0.5 ft		Head Diff > 1.0 ft		Head Diff > 2.0 ft	
		Distance Min	Distance Max	Distance Min	Distance Max	Distance Min	Distance Max	Distance Min	Distance Max
1	Run81 - Run33	0	27300	0	9200/900	0	9200/0	0	0
2	Run82 - Run34	0	9200/700	0	9200/0	0	0	0	0
3	Run83 - Run35	0	27000	0	9200/800	0	9200/0	0	0
4	Run84 - Run36	0	9200/700	0	8200/0	0	0	0	0
5	Run85 - Run37	0	32600	0	9200/4800	0	9200/400	0	9200/0
6	Run86 - Run38	0	9200/800	0	9200/0	0	0	0	0
7	Run87 - Run39	0	32600	0	9200/4100	0	9200/500	0	9200/0
8	Run88 - Run40	0	9200/900	0	9200/0	0	9200/0	0	0

Table G35. Approximate minimum and maximum distances (in ft) from the HHD to various head differential values in Reach 3 (for Table F5).

ID*	Pressure Head Comparison (w/ project - w/o project)	Head Diff > 0.1 ft		Head Diff > 0.5 ft		Head Diff > 1.0 ft		Head Diff > 2.0 ft	
		Distance Min	Distance Max	Distance Min	Distance Max	Distance Min	Distance Max	Distance Min	Distance Max
1	Run81 - Run33	0	0	0	0	0	0	0	0
2	Run82 - Run34	0	0	0	0	0	0	0	0
3	Run83 - Run35	0	0	0	0	0	0	0	0
4	Run84 - Run36	0	0	0	0	0	0	0	0
5	Run85 - Run37	0	2500	0	0	0	0	0	0
6	Run86 - Run38	0	100	0	0	0	0	0	0
7	Run87 - Run39	0	16000	0	50	0	0	0	0
8	Run88 - Run40	0	1000	0	0	0	0	0	0

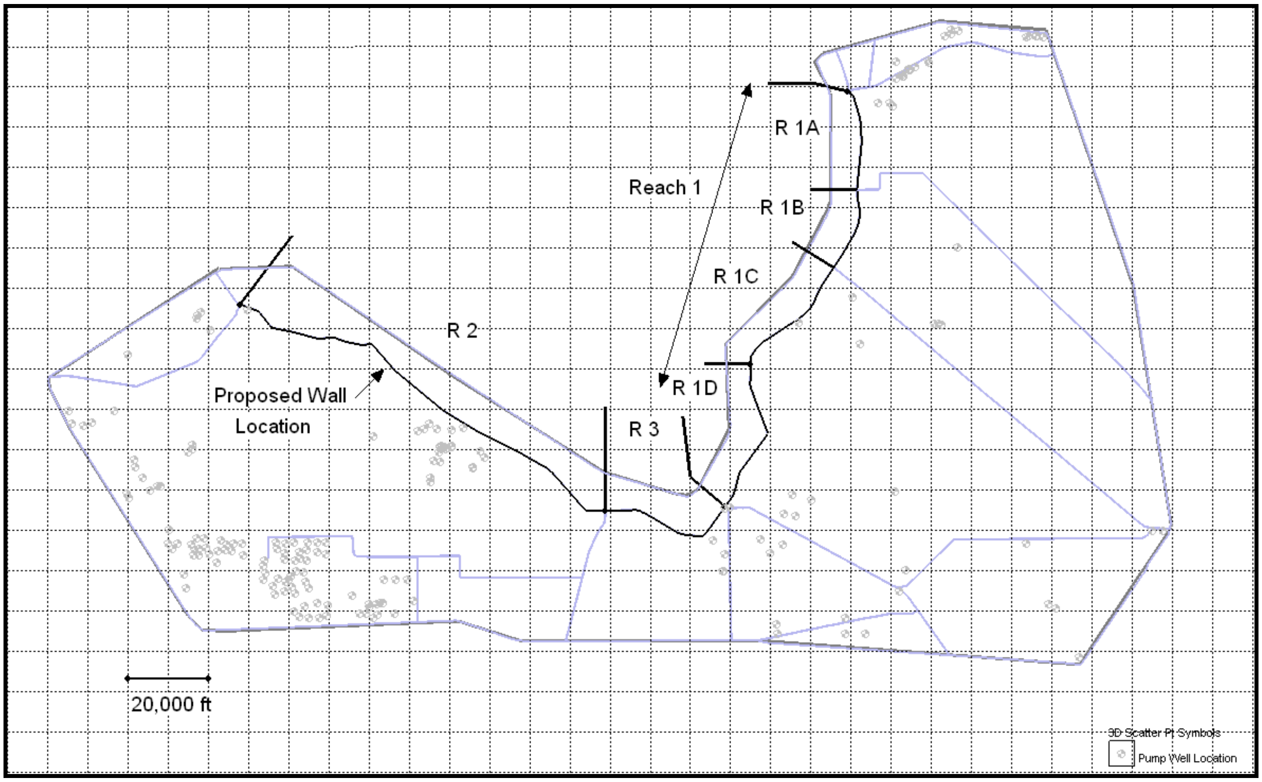


Figure G1. The numerical domain outline shown in dark gray. The proposed HHD project wall and reach identifier labels are shown in black. Canals outlines are light blue, and extraction pump well locations are shown as light gray circular symbols.

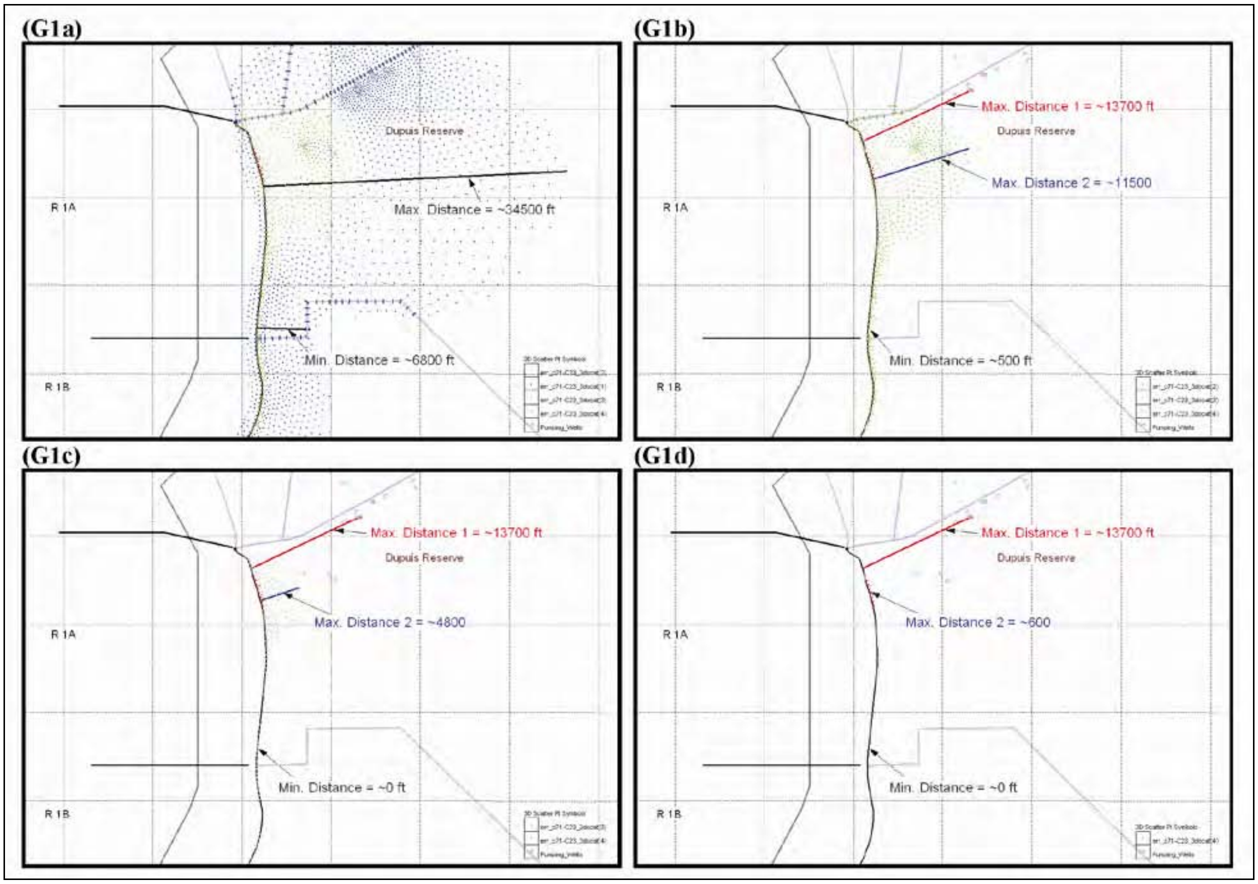


Figure G2. The maximum and minimum distances measured for head differential values greater than or equal to 0.1 ft (G1a), 0.5ft (G1b), 1 ft (G1c), and 2 ft (G1d) for the comparison of "Run71 – Run23" in Reach 1A.

Updated head difference plots associated with Tables F3 and F5 (i.e., for Request 4).

In this sections, two plots are made for each pair of comparison included in Table F3 (i.e., Table G6, when the medium net recharge and head boundary conditions with high pumping was considered) and Table F5 (i.e., Table G7, when the low net recharge and head boundary conditions with high pumping was considered). The first plot shows the pressure head difference between a pair of "with project" and "with project" runs that is represented with plan-view scatter symbol and the second plot marks the pumping wells that went dry in the "w/o project" run. The color code for the scatter symbols is the same as defined in Appendix F, as shown below.

0.1 ≤ Pressure Head Difference ≤ 0.5	Blue
0.5 ≤ Pressure Head Difference ≤ 1.0	Lime Green
1.0 ≤ Pressure Head Difference ≤ 2.0	Yellow
Pressure Head Difference ≥ 2.0	Red

The head difference plots are the same as their corresponding figures in Appendix F except that the background is white here, instead of gray in Appendix F, and all pumping well locations are marked as requested. Figures G3 through G18 are associated with Table F3 (or Table G6), and Figures G19 through G34 are associated with Table F5 (or Table G7).

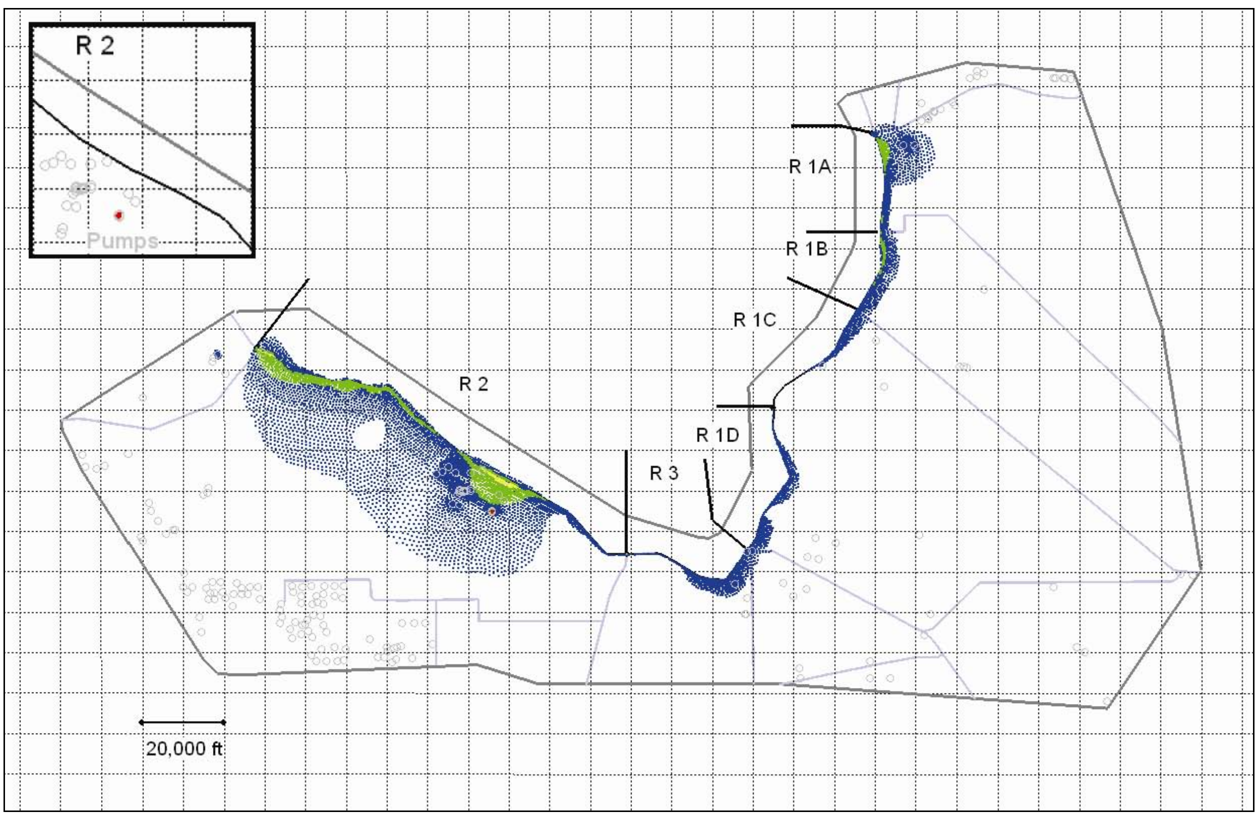


Figure G3. Pressure head comparison between "with project" and “with project” runs in Stage 2 analysis: medium net recharge and head boundary conditions, high pumping, high L2-1 K, high L3A K, and high L3B-2 K (Set C: Run65 - Run17, same as Figure F17, except with white background and pump locations).

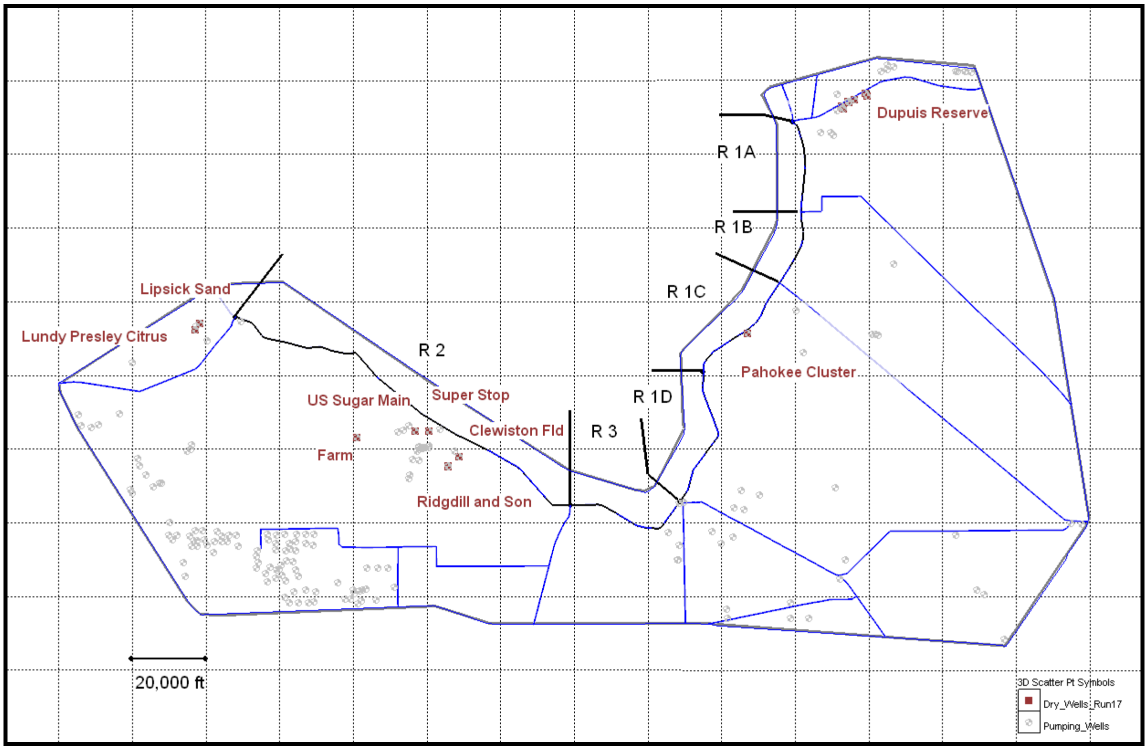


Figure G4. Wash nodal locations corresponding to extraction wells dewatered during simulation Run 17 (w/o project).

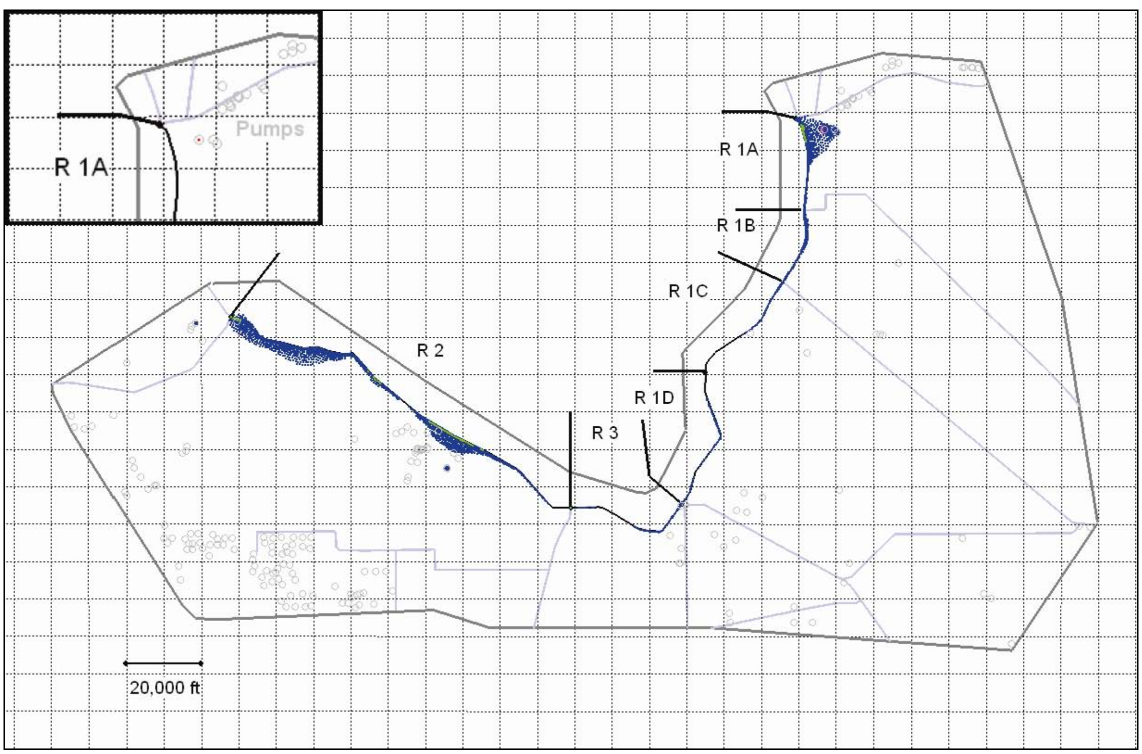


Figure G5. Pressure head comparison between "with project" and “with project” runs in Stage 2 analysis: medium net recharge and head boundary conditions, high pumping, high L2-1 K, low L3A K, and high L3B-2 K (Set C: Run66 - Run18, same as Figure F18, except with white background and pump locations).

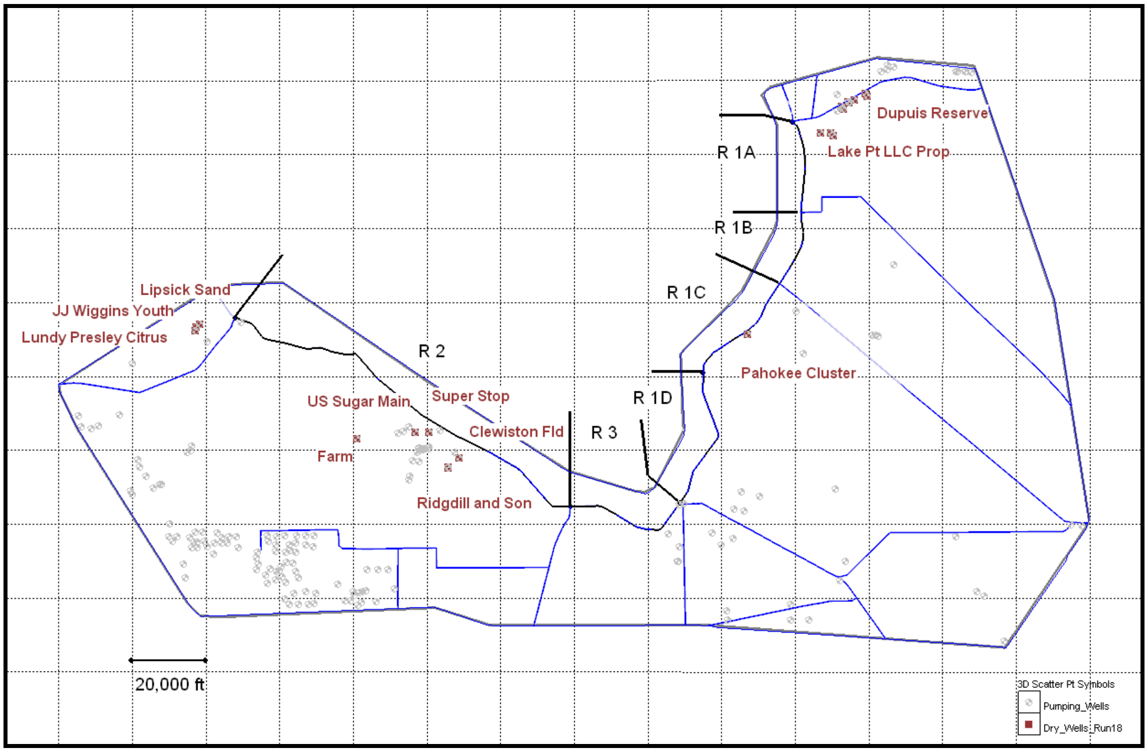


Figure G6. Wash nodal locations corresponding to extraction wells dewatered during simulation Run 18 (w/o project).

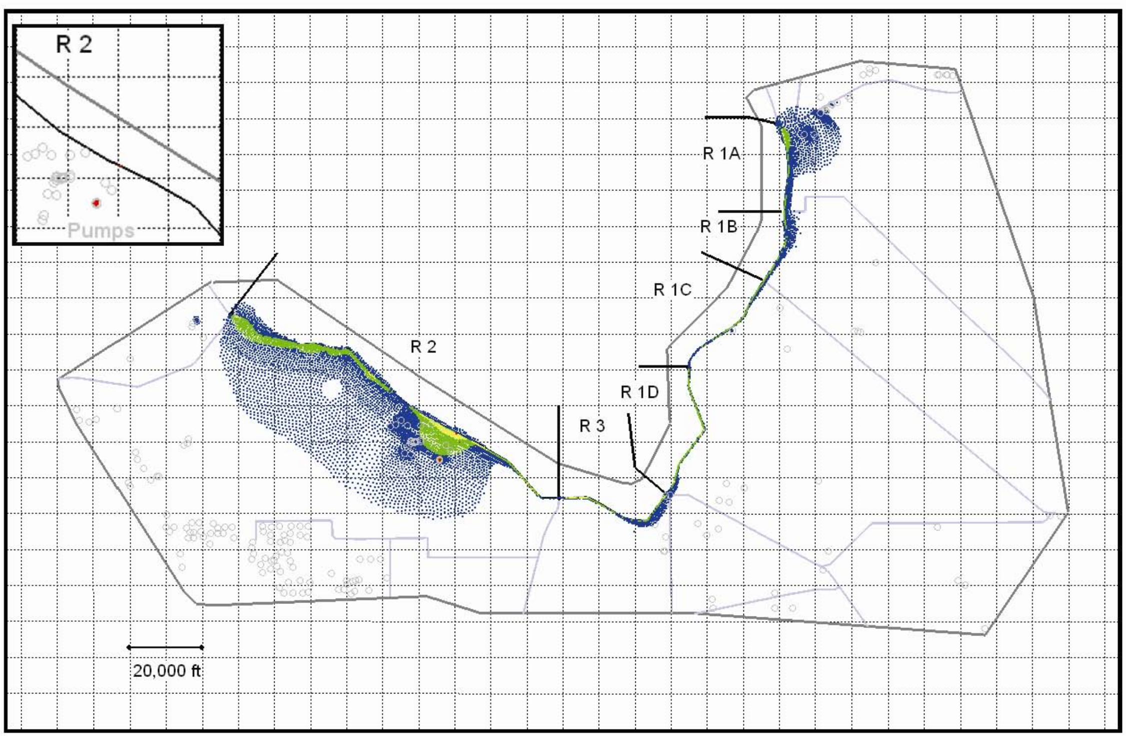


Figure G7. Pressure head comparison between "with project" and “with project” runs in Stage 2 analysis: medium net recharge and head boundary conditions, high pumping, low L2-1 K, high L3A K, and high L3B-2 K (Set C: Run67 - Run19, same as Figure F19, except with white background and pump locations).

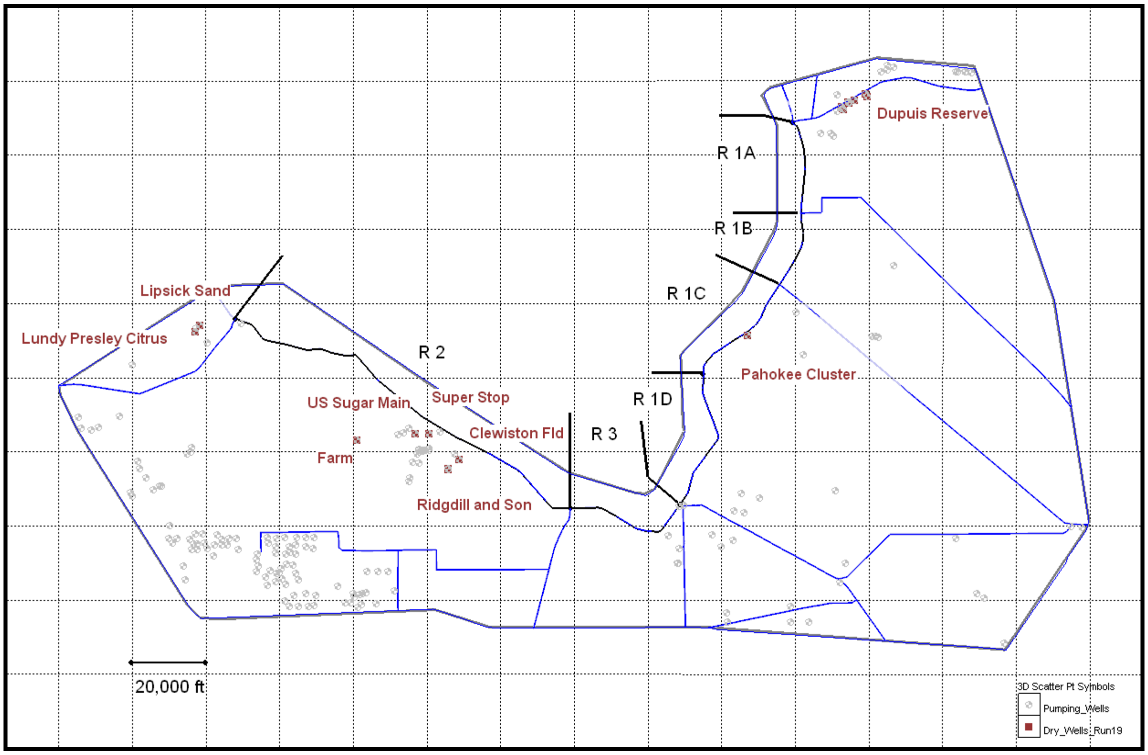


Figure G8. Wash nodal locations corresponding to extraction wells dewatered during simulation Run 19 (w/o project).

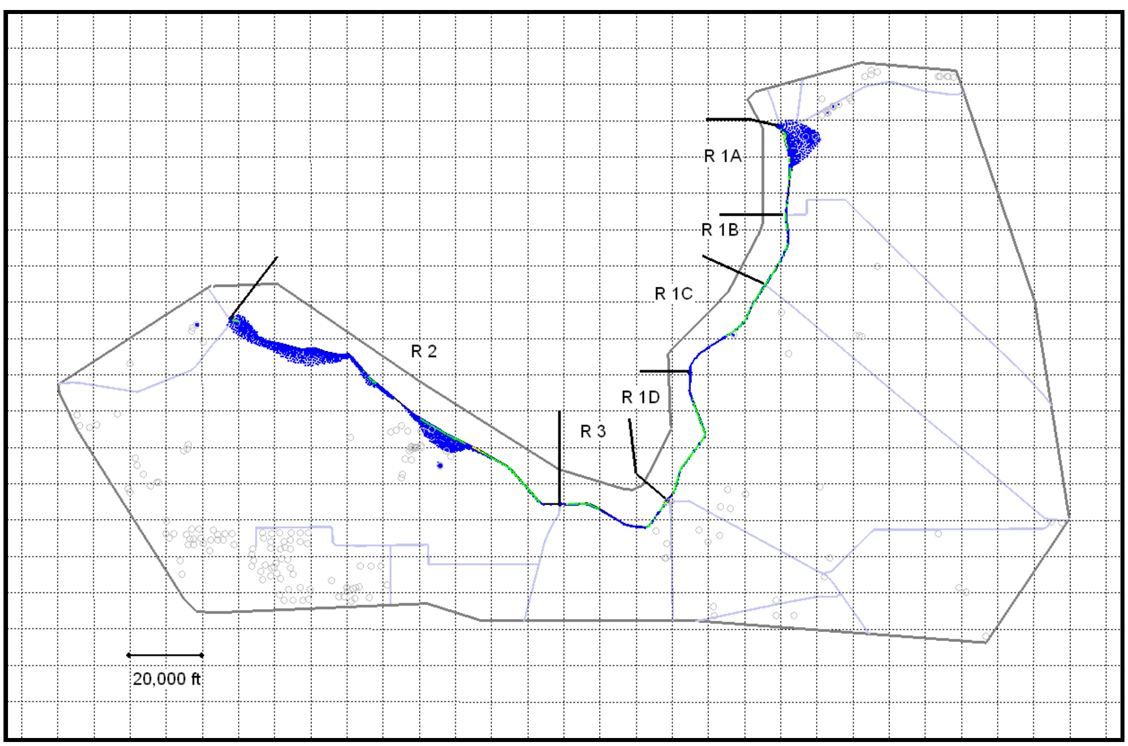


Figure G9. Pressure head comparison between "with project" and “with project” runs in Stage 2 analysis: medium net recharge and head boundary conditions, high pumping, low L2-1 K, low L3A K, and high L3B-2 K (Set C: Run68 - Run20, same as Figure F20, except with white background and pump locations).

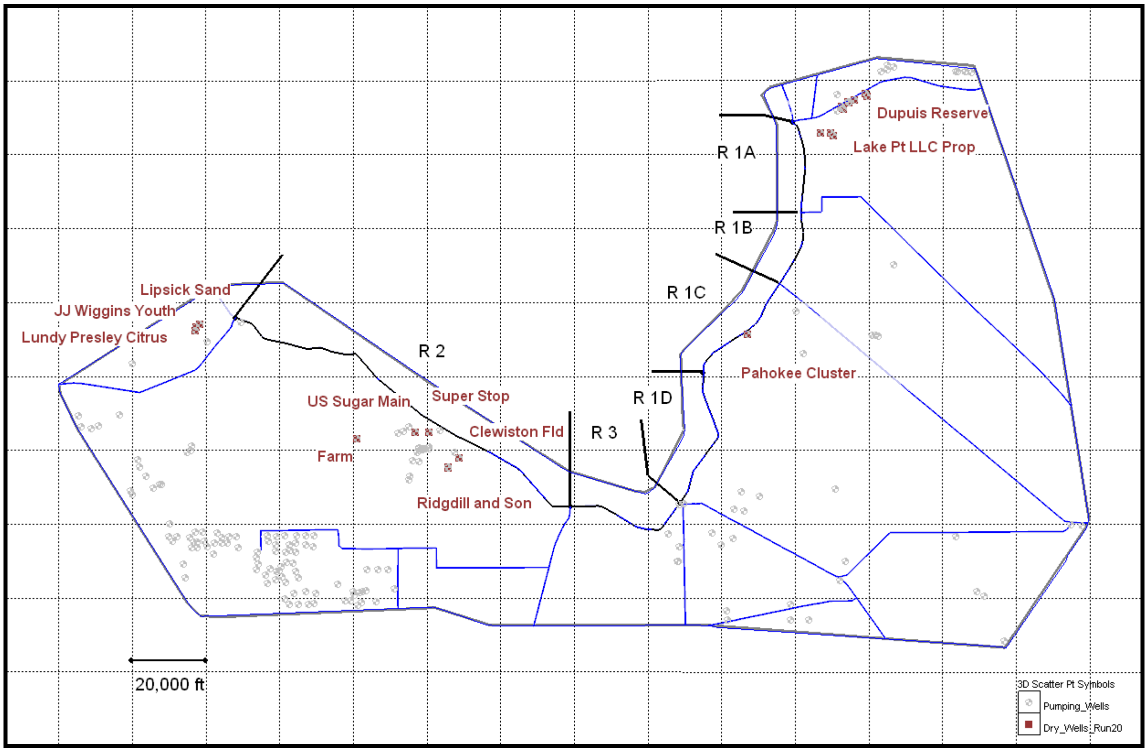


Figure G10. Wash nodal locations corresponding to extraction wells dewatered during simulation Run 20 (w/o project).

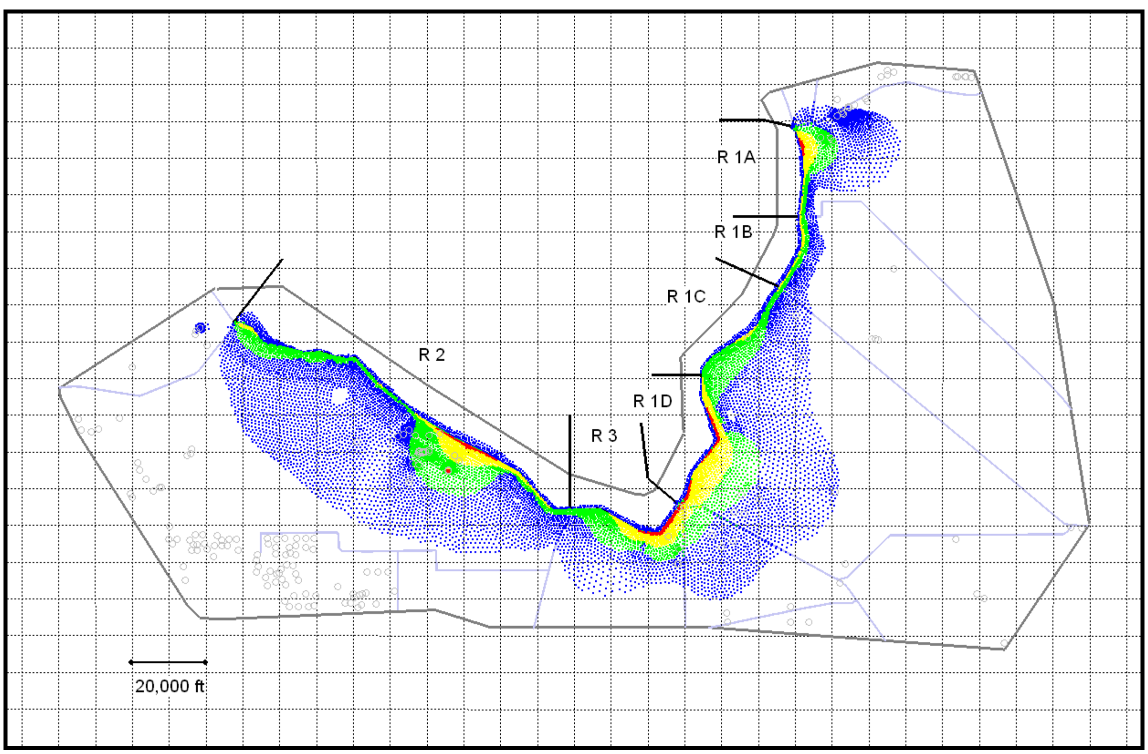


Figure G11. Pressure head comparison between "with project" and "with project" runs in Stage 2 analysis: medium net recharge and head boundary conditions, high pumping, high L2-1 K, high L3A K, and low L3B-2 K (Set C: Run69 - Run21, same as Figure F21, except with white background and pump locations).

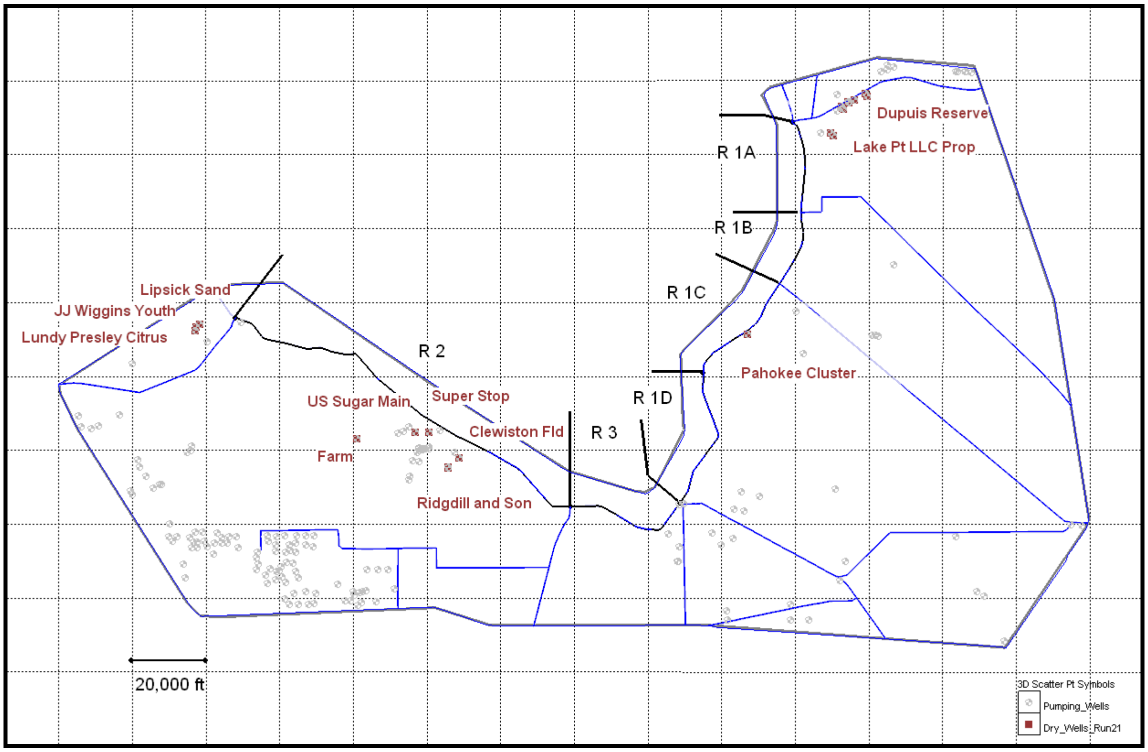


Figure G12. Wash nodal locations corresponding to extraction wells dewatered during simulation Run 21 (w/o project).

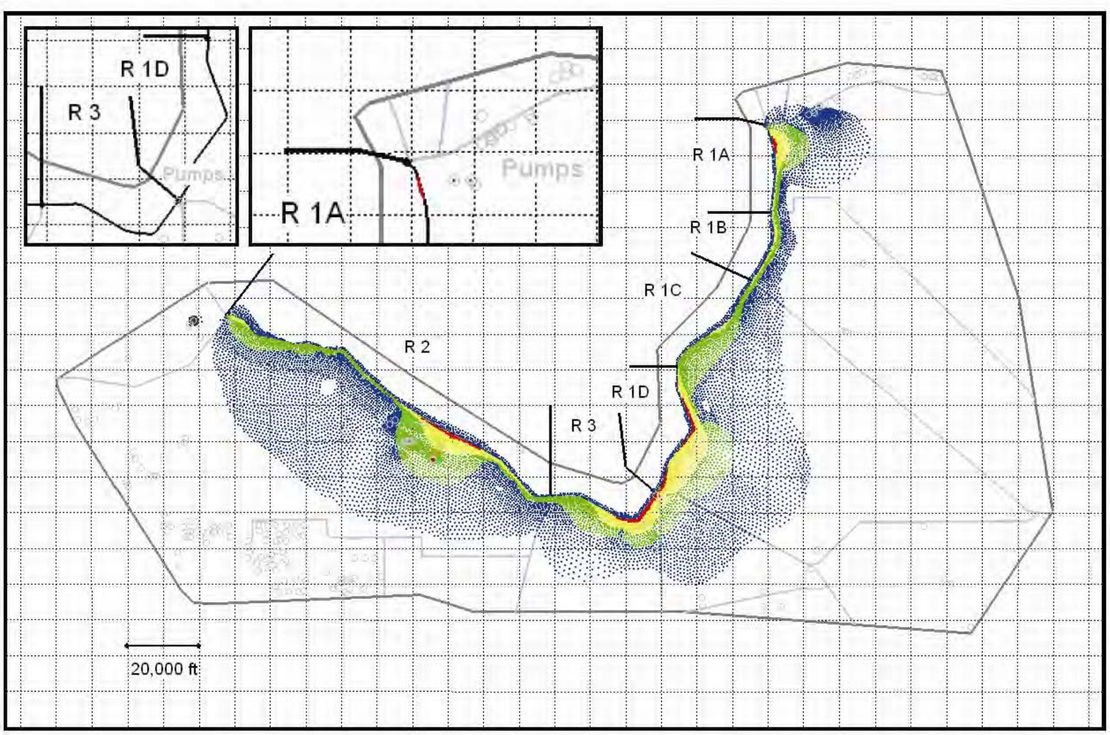


Figure G13. Pressure head comparison between "with project" and “with project” runs in Stage 2 analysis: medium net recharge and head boundary conditions, high pumping, high L2-1 K, low L3A K, and low L3B-2 K (Set C: Run70 - Run22, same as Figure F22, except with white background and pump locations).

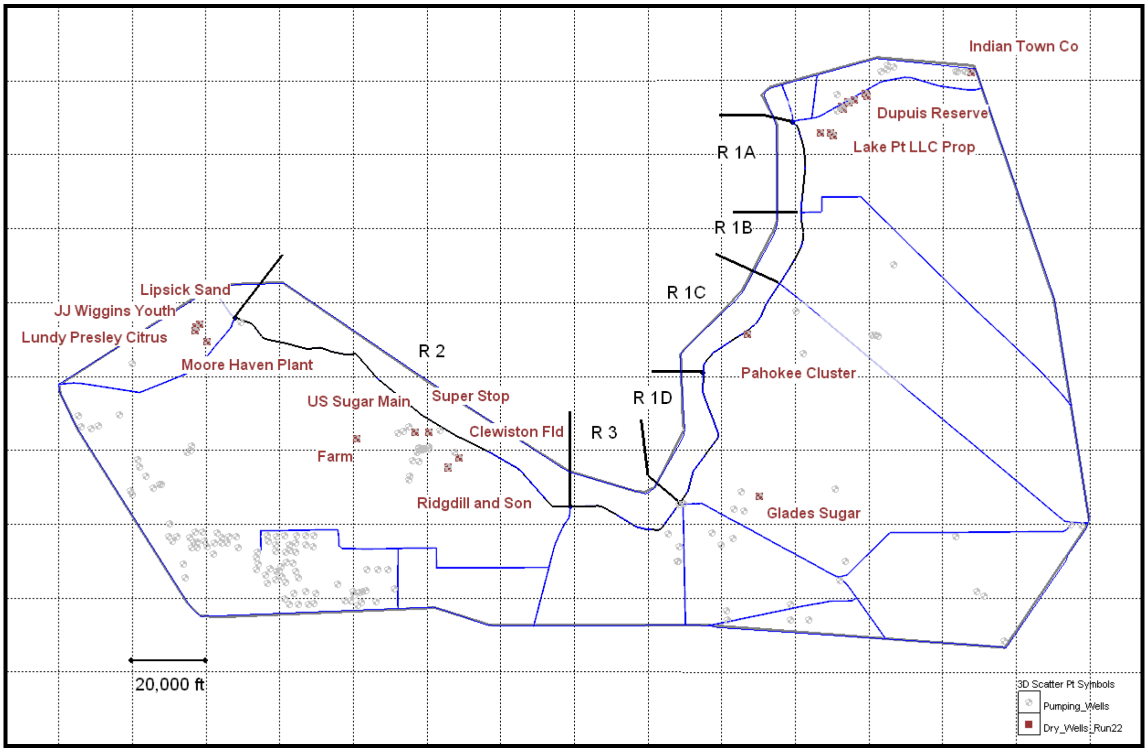


Figure G14. Wash nodal locations corresponding to extraction wells dewatered during simulation Run 22 (w/o project).

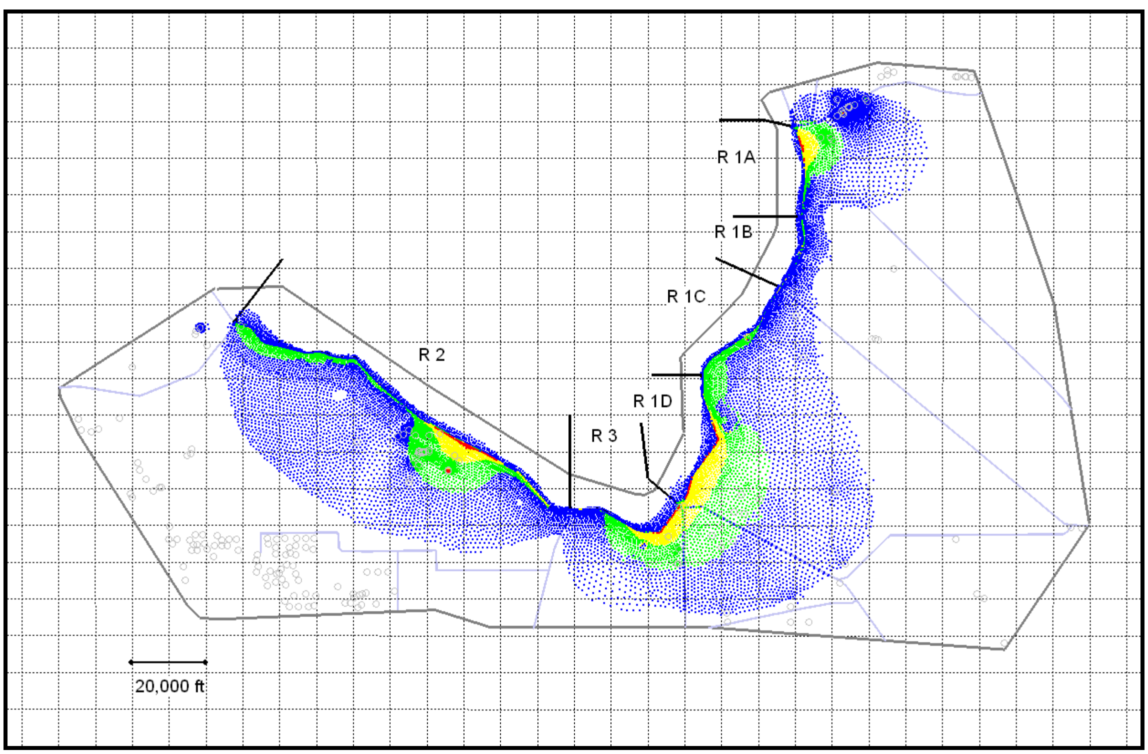


Figure G15. Pressure head comparison between "with project" and “with project” runs in Stage 2 analysis: medium net recharge and head boundary conditions, high pumping, low L2-1 K, high L3A K, and low L3B-2 K (Set C: Run71 - Run23, same as Figure F23, except with white background and pump locations).

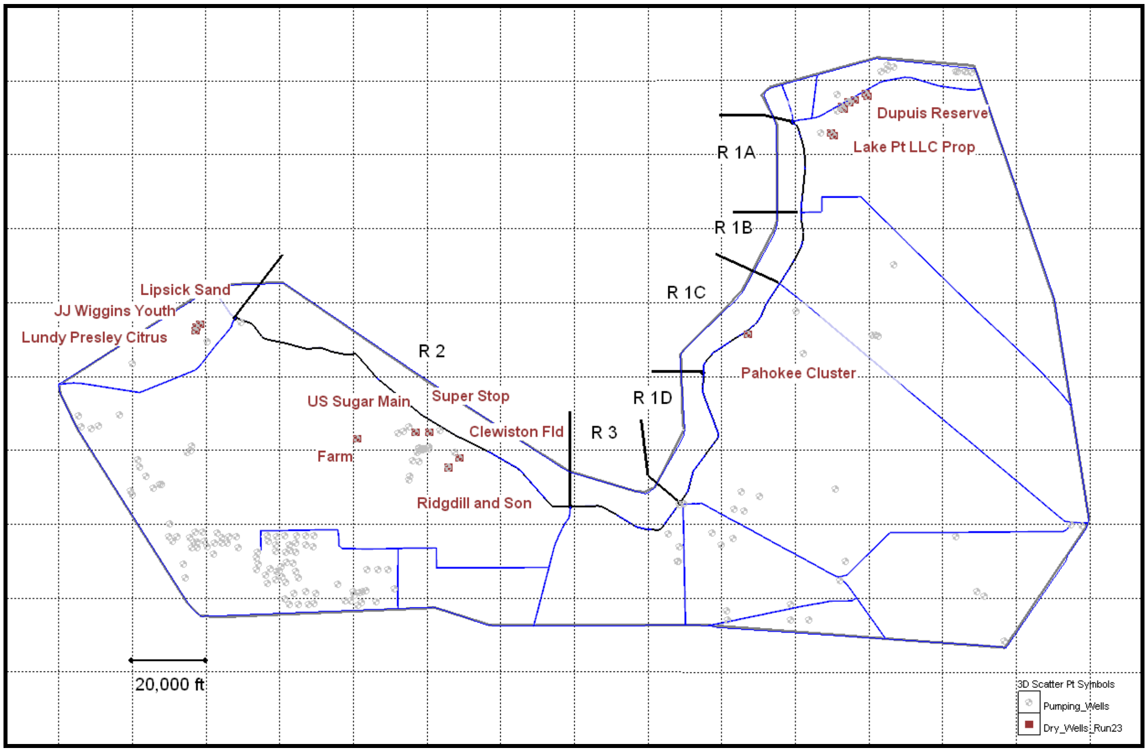


Figure G16. Wash nodal locations corresponding to extraction wells dewatered during simulation Run 23 (w/o project).

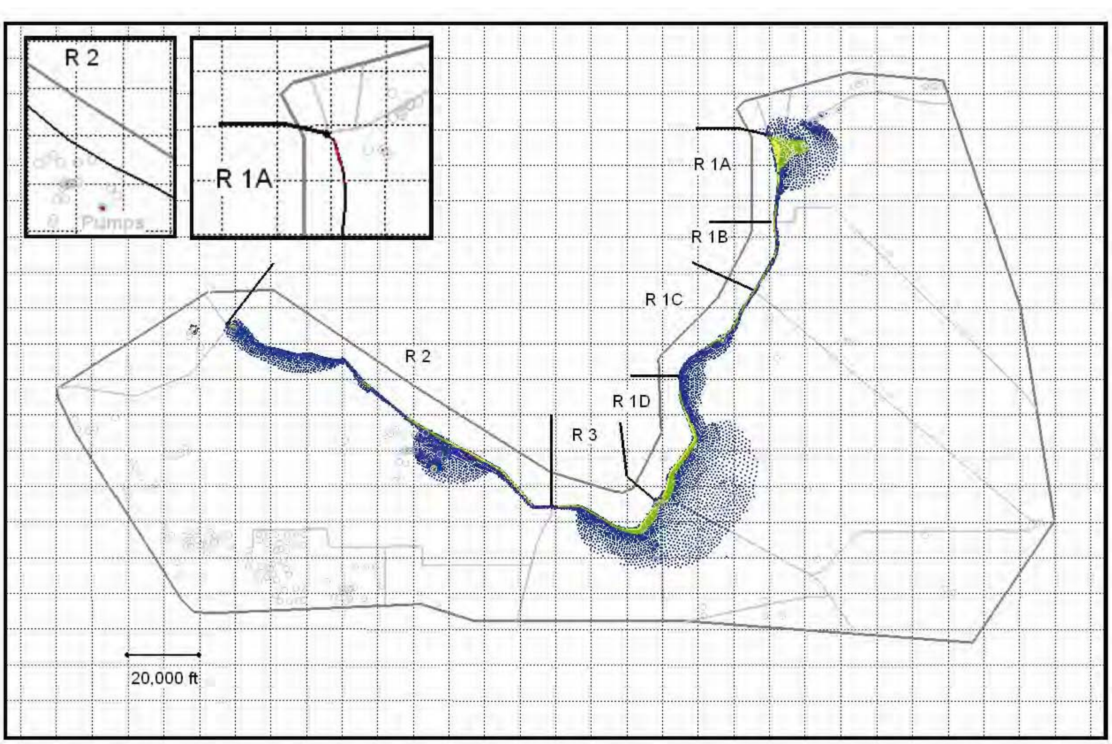


Figure G17. Pressure head comparison between "with project" and "with project" runs in Stage 2 analysis: medium net recharge and head boundary conditions, high pumping, low L2-1 K, low L3A K, and low L3B-2 K (Set C: Run72 - Run24, same as Figure F24, except with white background and pump locations).

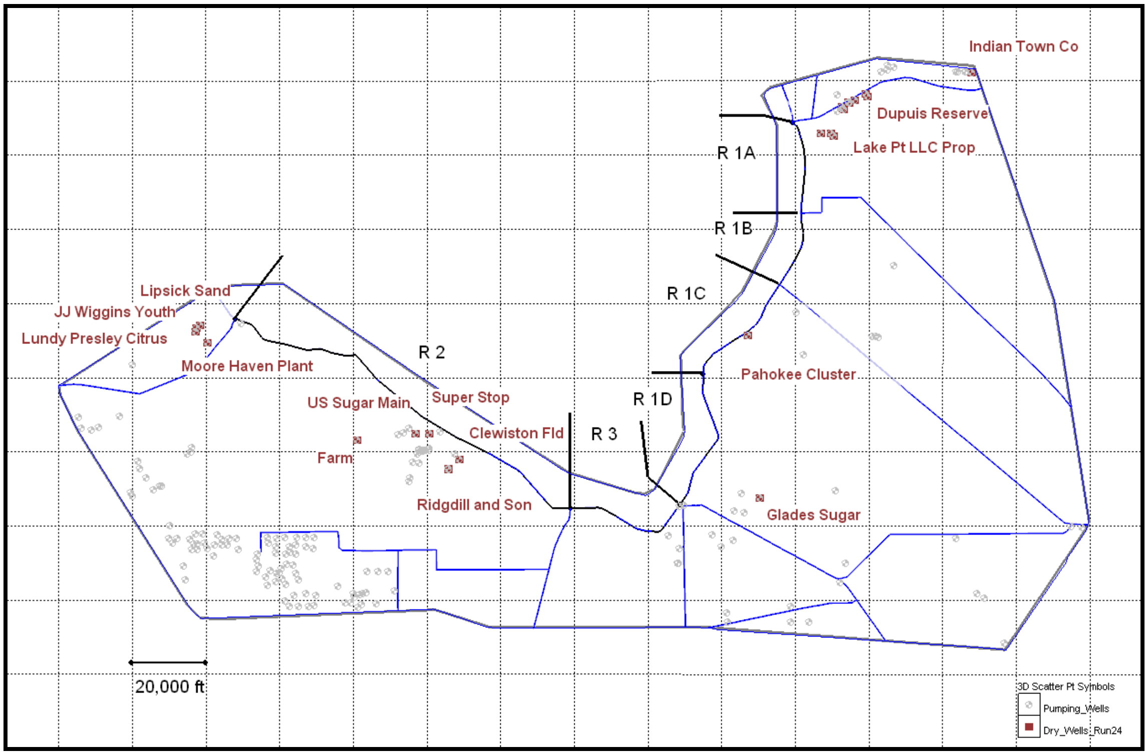


Figure G18. Wash nodal locations corresponding to extraction wells dewatered during simulation Run 24 (w/o project).

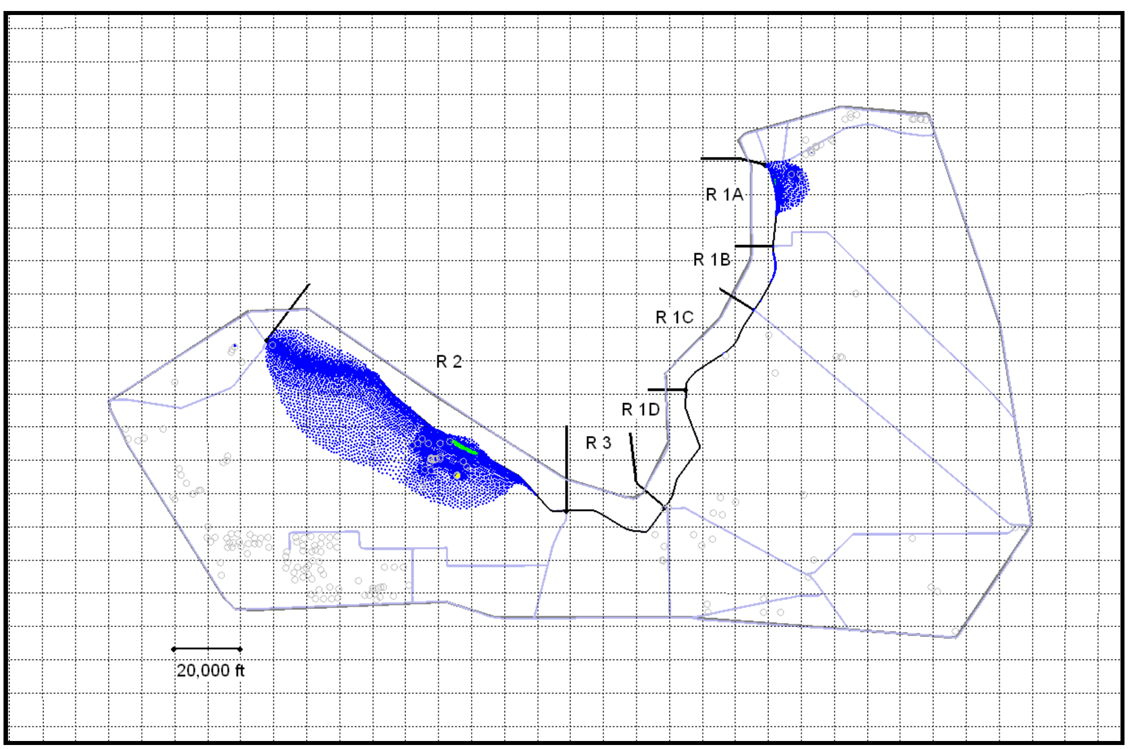


Figure G19. Pressure head comparison between "with project" and “with project” runs in Stage 2 analysis: low net recharge and head boundary conditions, high pumping, high L2-1 K, high L3A K, and high L3B-2 K (Set E: Run81 - Run33, same as Figure F33 except with white background and pump locations).

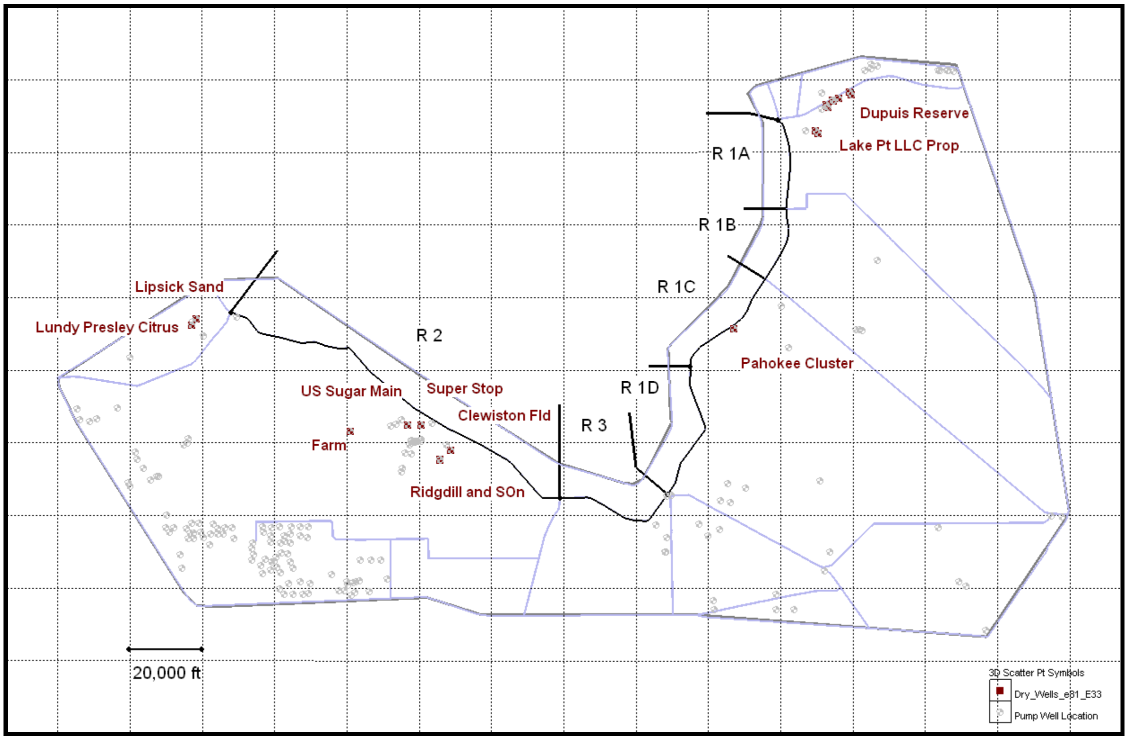


Figure G20. Wash nodal locations corresponding to extraction wells dewatered during simulation Run 33 (w/o project).

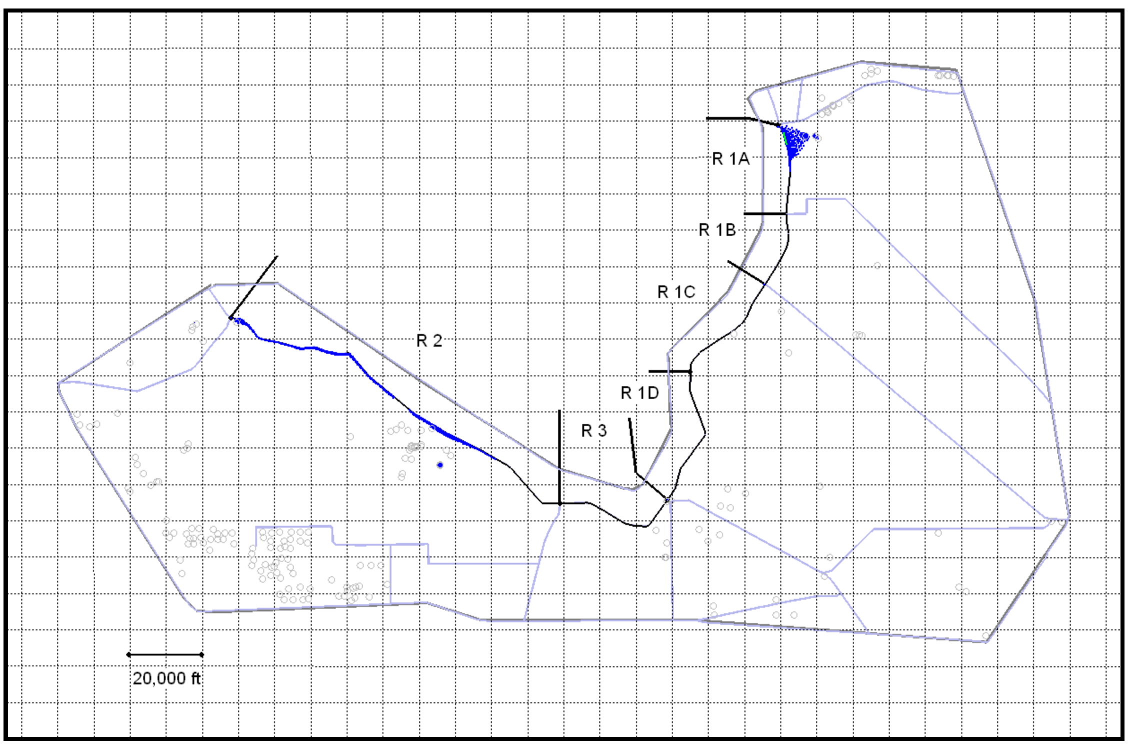


Figure G21. Pressure head comparison between "with project" and "with project" runs in Stage 2 analysis: low net recharge and head boundary conditions, high pumping, high L2-1 K, low L3A K, and high L3B-2 K (Set E: Run 82 - Run34, same as Figure F34 except with white background and pump locations).

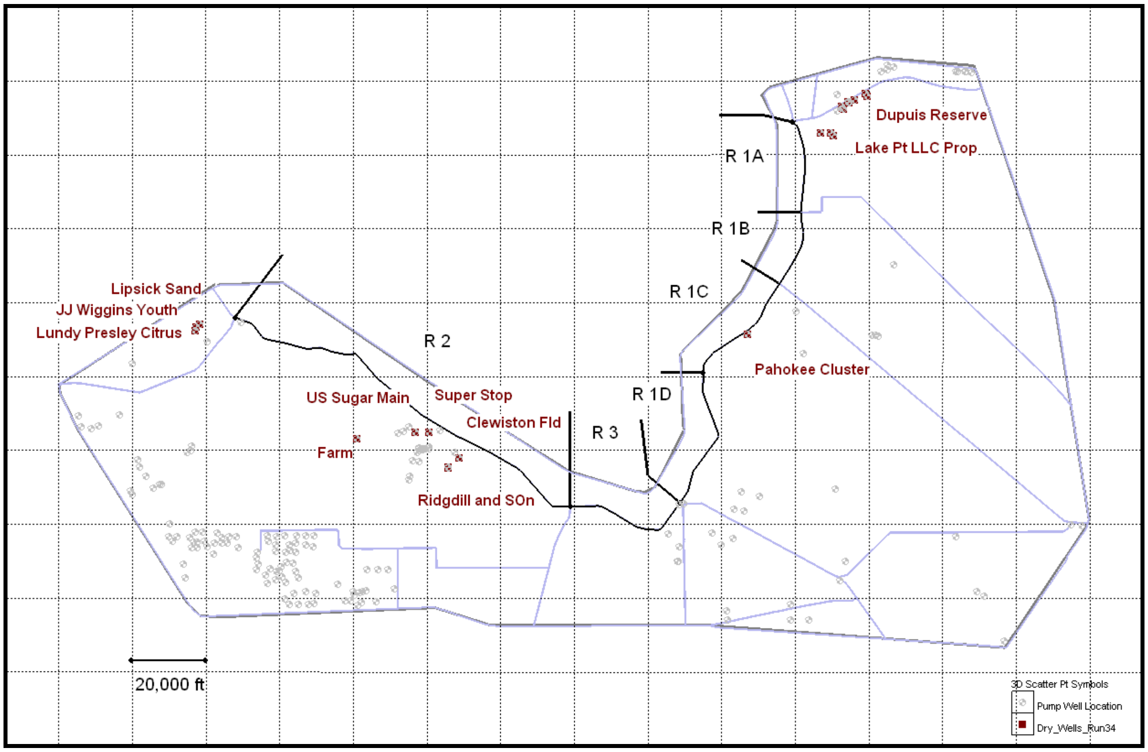


Figure G22. Wash nodal locations corresponding to extraction wells dewatered during simulation Run 34 (w/o project).

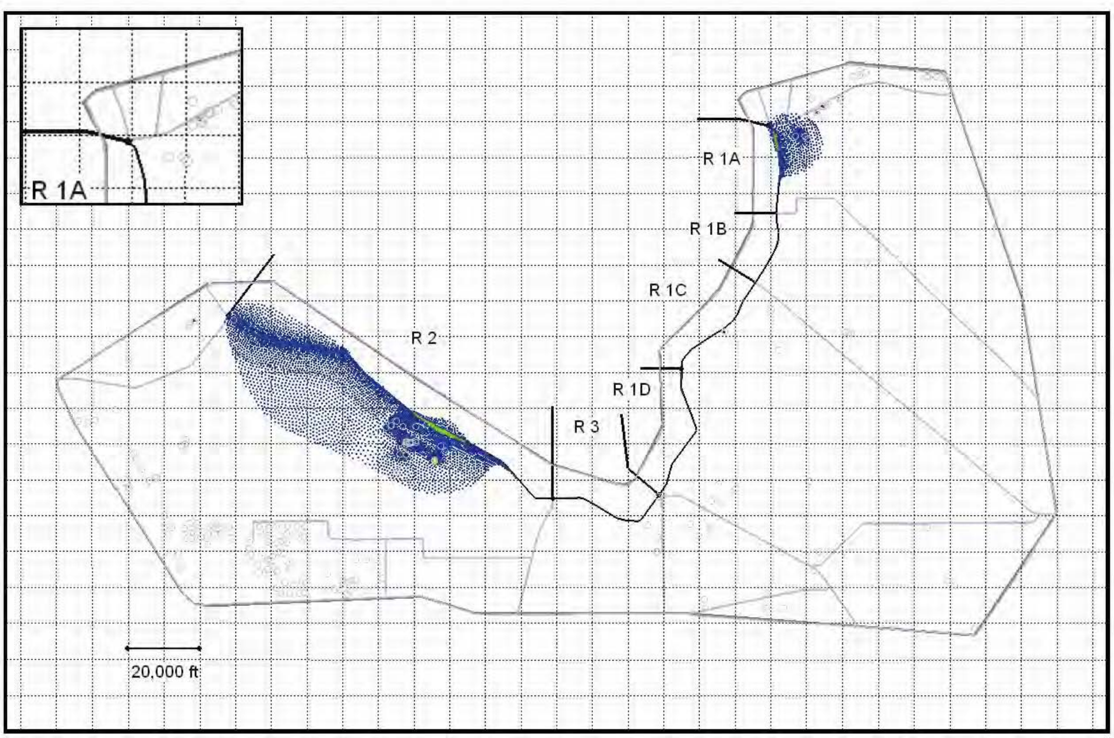


Figure G23. Pressure head comparison between "with project" and "with project" runs in Stage 2 analysis: low net recharge and head boundary conditions, high pumping, low L2-1 K, high L3A K, and high L3B-2 K (Set E: Run83 - Run35, same as Figure F35 except with white background and pump locations).

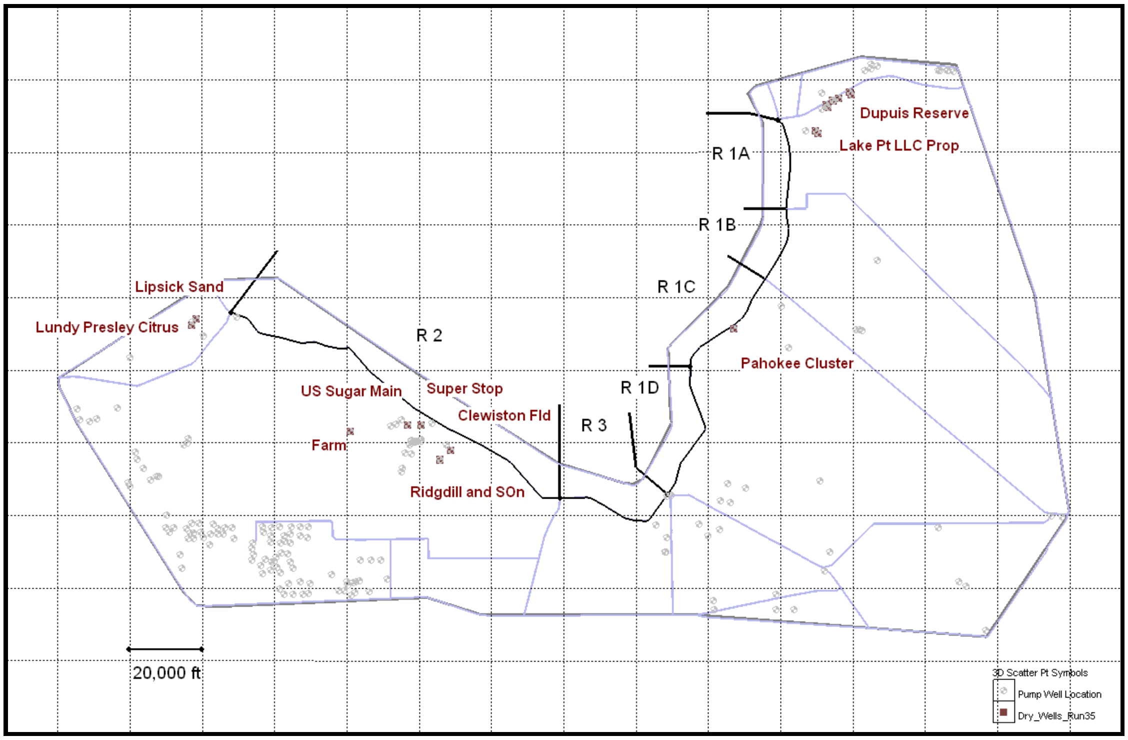


Figure G24. Wash nodal locations corresponding to extraction wells dewatered during simulation Run 35 (w/o project).

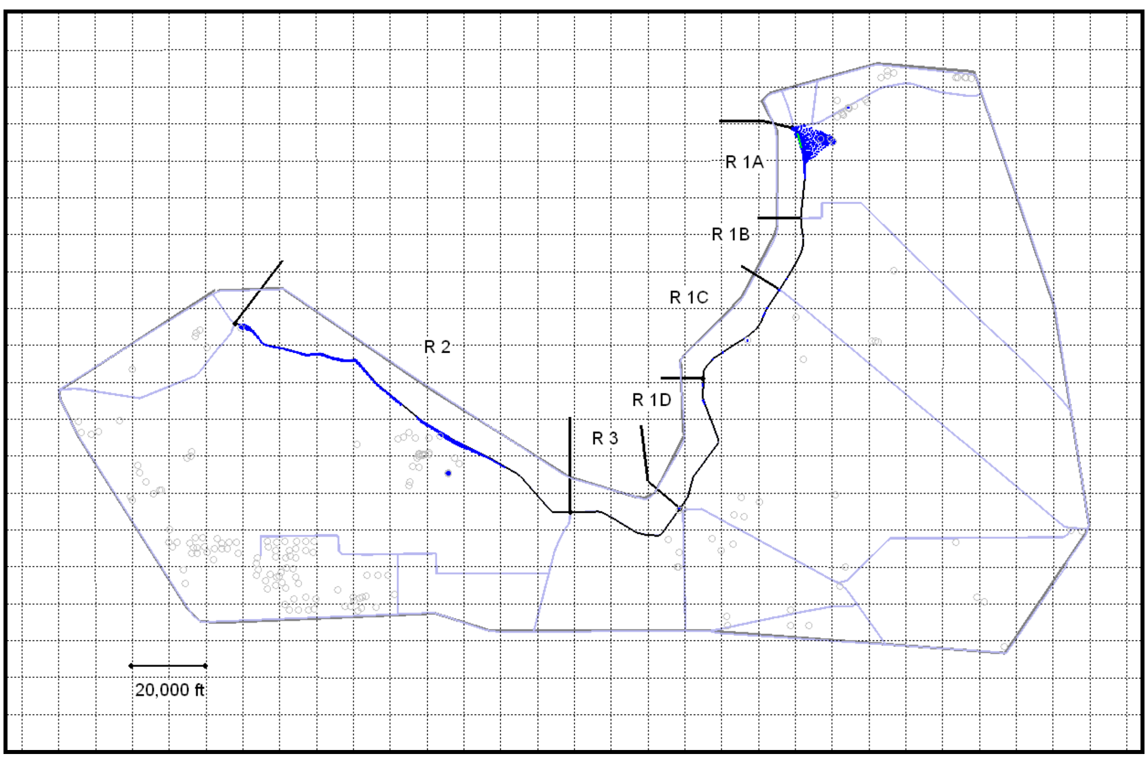


Figure G25. Pressure head comparison between "with project" and “with project” runs in Stage 2 analysis: low net recharge and head boundary conditions, high pumping, low L2-1 K, low L3A K, and high L3B-2 K (Set E: Run84 - Run36, same as Figure F36 except with white background and pump locations).

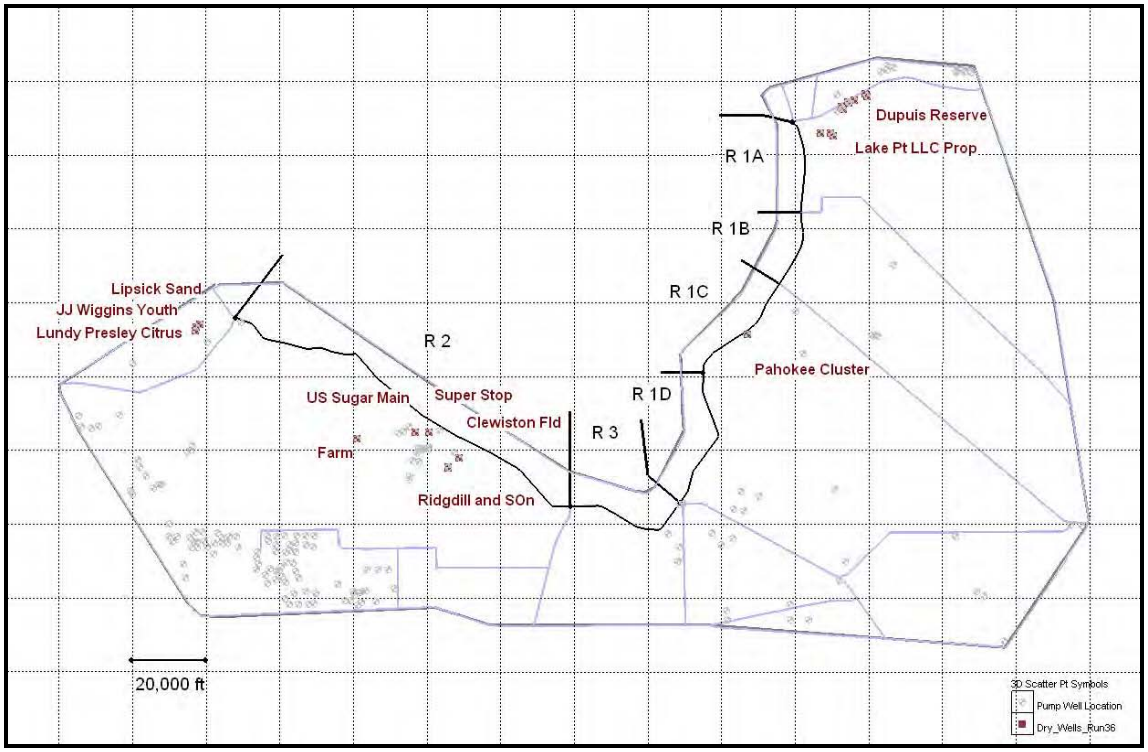


Figure G26. Wash nodal locations corresponding to extraction wells dewatered during simulation Run 36 (w/o project).

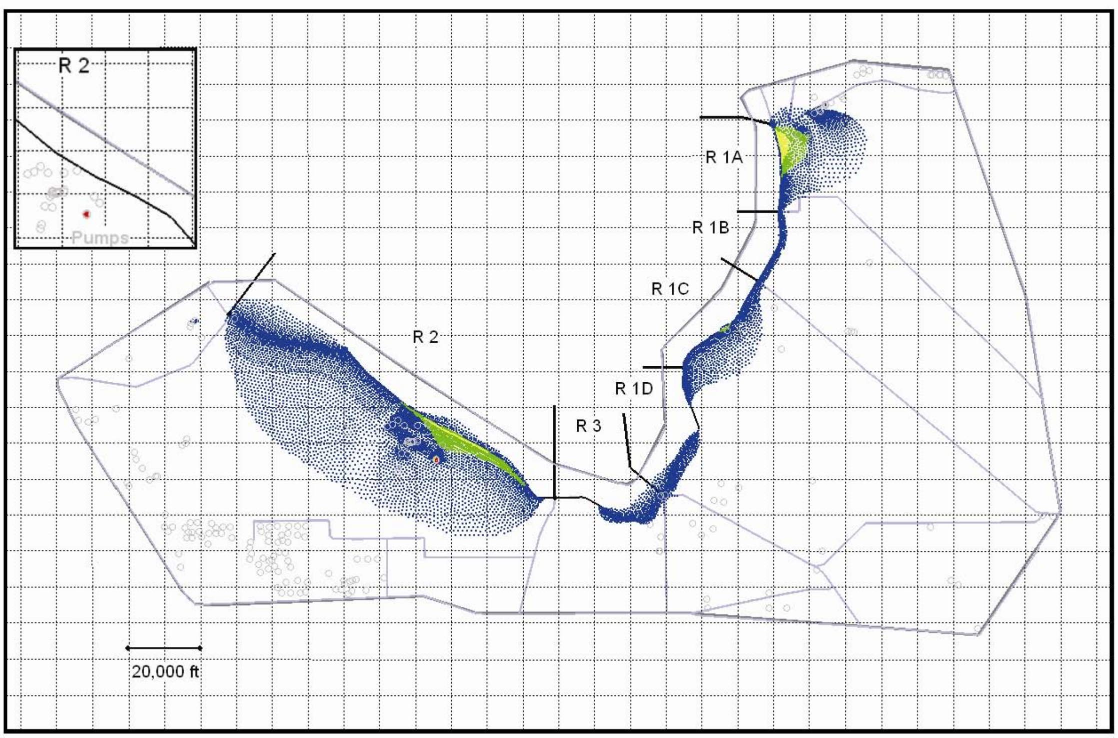


Figure G27. Pressure head comparison between "with project" and "with project" runs in Stage 2 analysis: low net recharge and head boundary conditions, high pumping, high L2-1 K, high L3A K, and low L3B-2 K (Set E: Run85 - Run37, same as Figure F37 except with white background and pump locations).

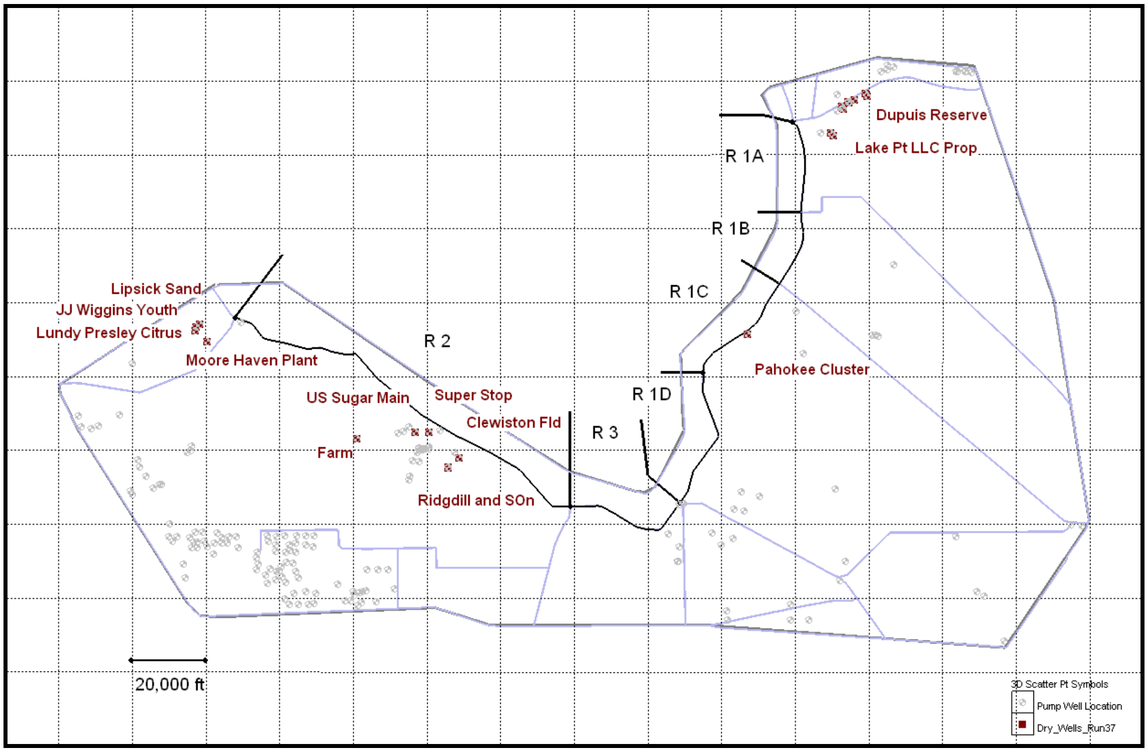


Figure G28. Wash nodal locations corresponding to extraction wells dewatered during simulation Run 37 (w/o project).

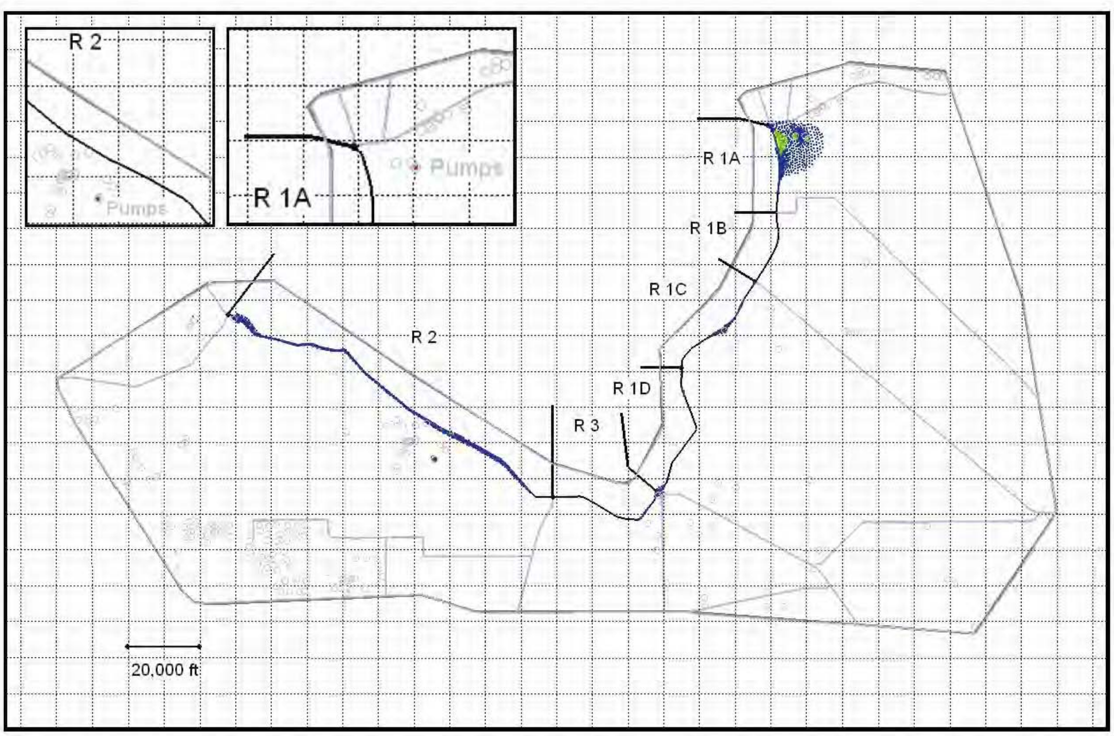


Figure G29. Pressure head comparison between "with project" and “with project” runs in Stage 2 analysis: low net recharge and head boundary conditions, high pumping, high L2-1 K, low L3A K, and low L3B-2 K (Set E: Run86 - Run38, same as Figure F38 except with white background and pump locations).

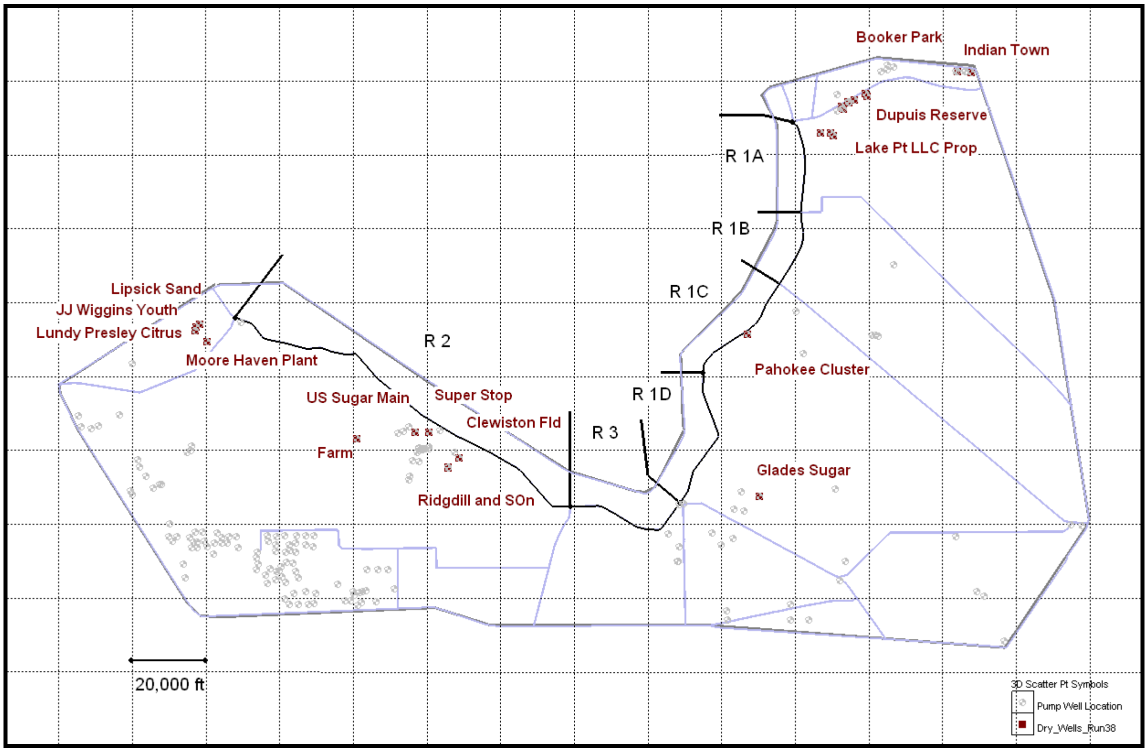


Figure G30. Wash nodal locations corresponding to extraction wells dewatered during simulation Run 38 (w/o project).

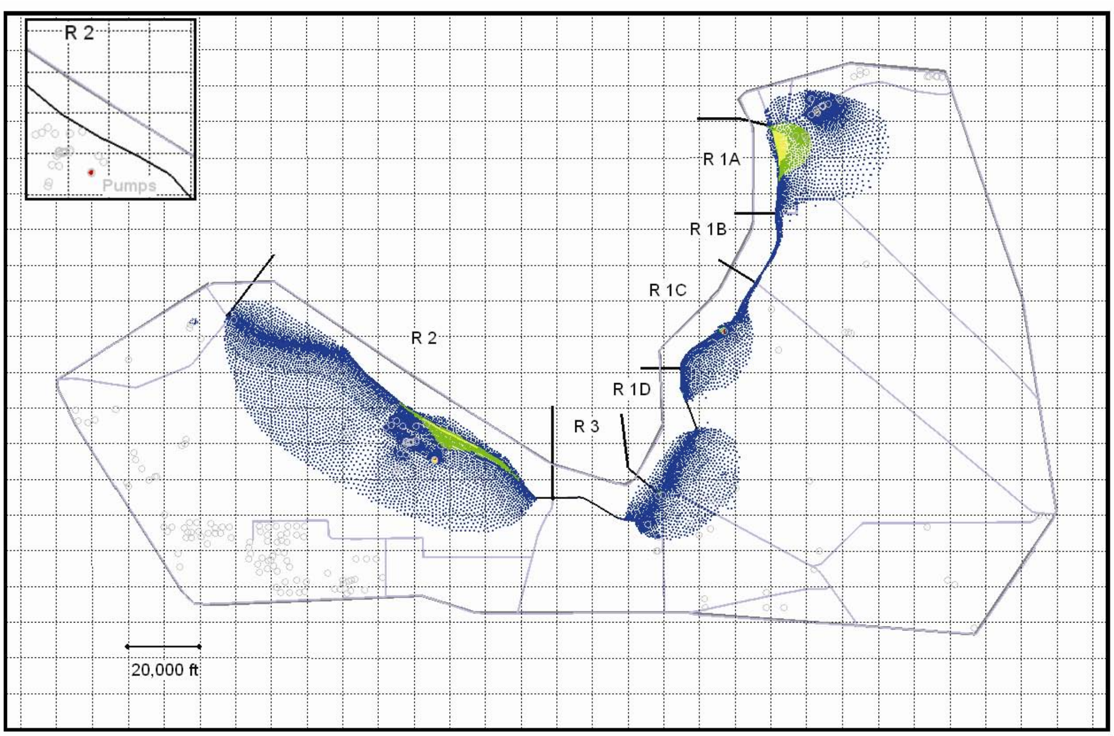


Figure G31. Pressure head comparison between "with project" and “with project” runs in Stage 2 analysis: low net recharge and head boundary conditions, high pumping, low L2-1 K, high L3A K, and low L3B-2 K (Set E: Run87 - Run39, same as Figure F39 except with white background and pump locations).

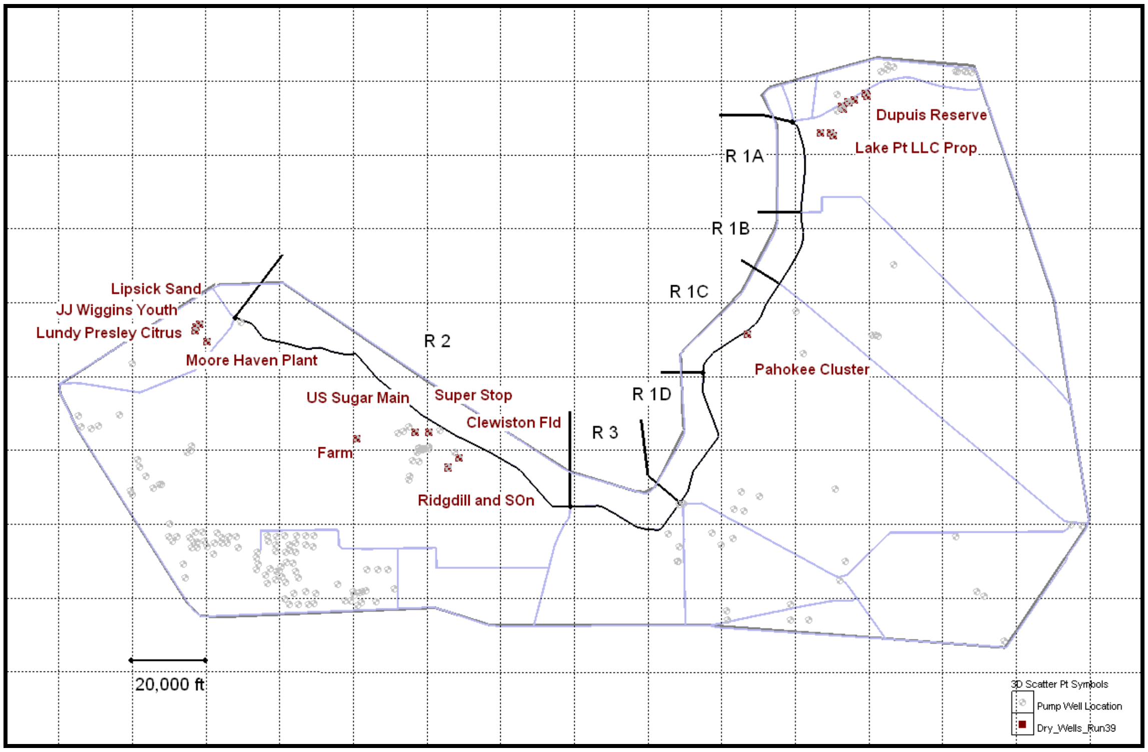


Figure G32. Wash nodal locations corresponding to extraction wells dewatered during simulation Run 39 (w/o project).

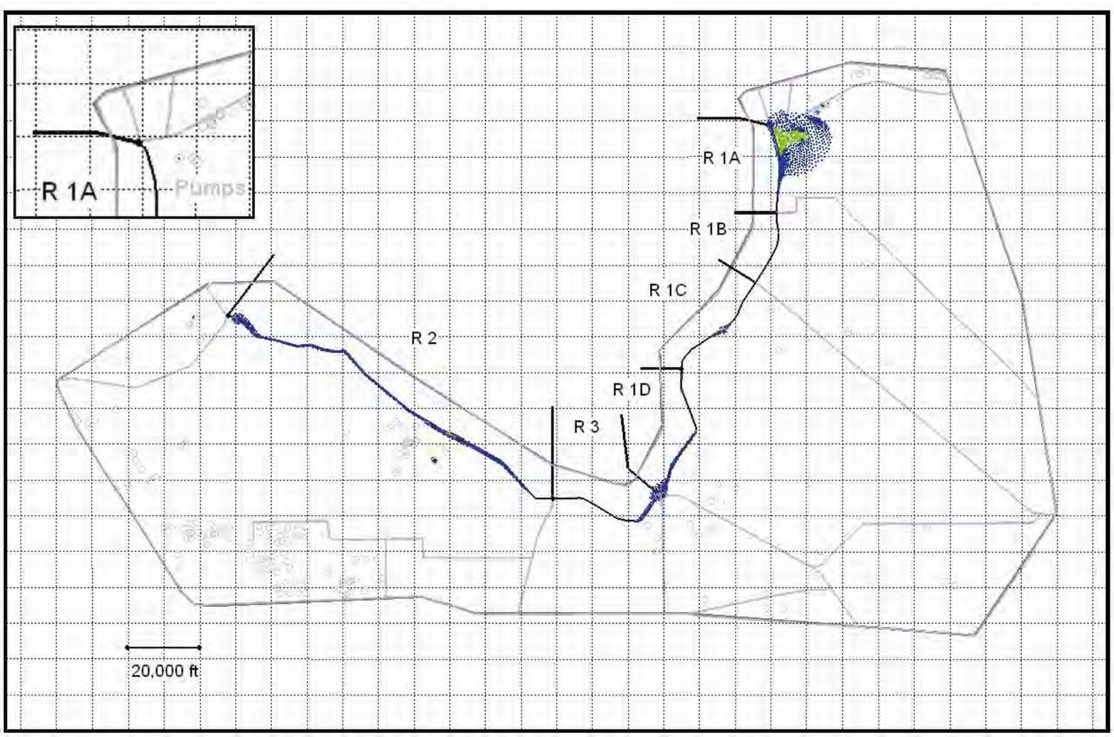


Figure G33. Pressure head comparison between "with project" and "with project" runs in Stage 2 analysis: low net recharge and head boundary conditions, high pumping, low L2-1 K, low L3A K, and low L3B-2 K (Set E: Run88 – Run40, same as Figure F40 except with white background and pump locations).

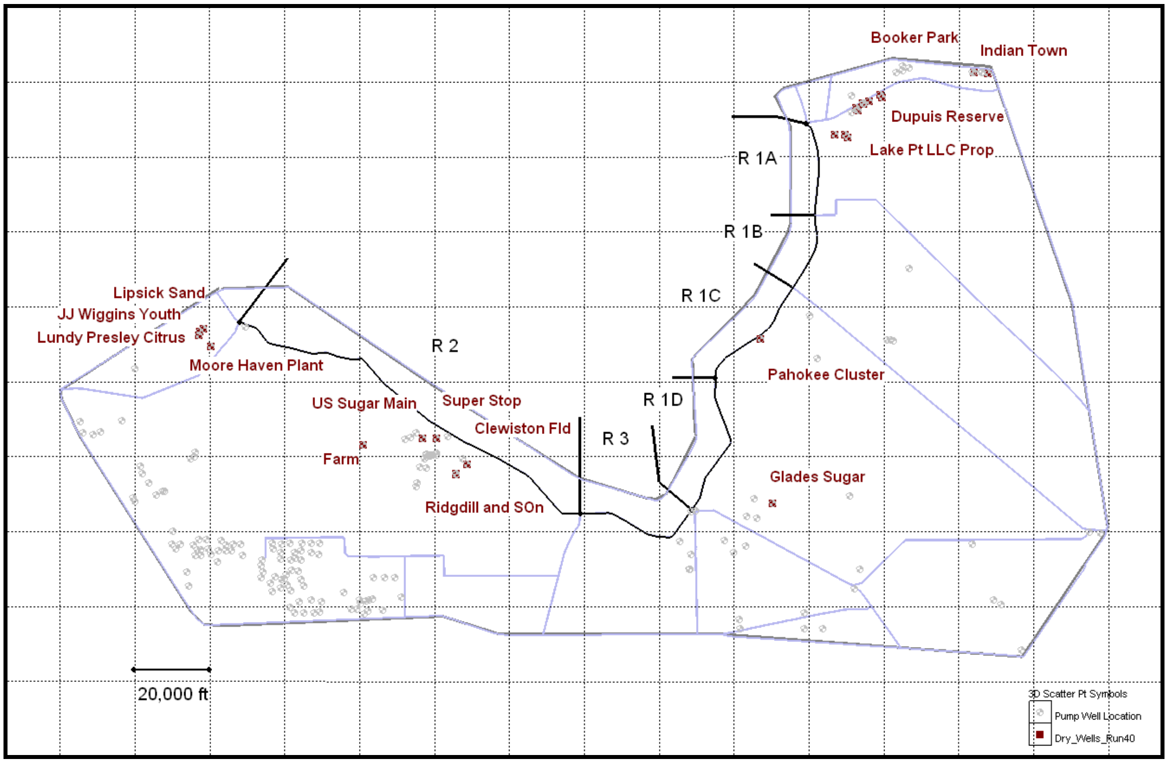


Figure G34. Wash nodal locations corresponding to extraction wells dewatered during simulation Run 40 (w/o project).

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Appendices A – G are provided on attached cd.

14. ABSTRACT This report presents the project that ERDC and NAP were tasked by SAJ to construct the HHD Phase 1A model. The purpose of the HHD Phase 1A modeling effort was to develop and evaluate a Lake Okeechobee sub-regional groundwater numerical model, and evaluate the sub-regional groundwater changes associated with the introduction of the cutoff wall segments into the subsurface geologic structure underlying Herbert Hoover Dike (Reaches 1 through 3). This report describes the background and goal, the modeling approach, the modeling tools, the collection and compilation of data used for model construction, the model construction processes, and the analysis of simulation results. A steady-state, 3-D groundwater model was developed to evaluate and bound the potential effects of the proposed cutoff wall. The computational results from the "with project", i.e., with cutoff wall, simulations were compared to those from the "without project", i.e., no wall, simulations in order to develop estimates of potential impacts to the sub-regional groundwater heads and flows. A two-stage analysis was conducted to effectively achieve the purpose of this study. Stage 1 sensitivity analysis, including 46 model runs, was used to determine the three most influential subsurface materials from the 11 materials considered. Stage 2 impact analysis, comprised 96 model runs, was used to investigate the cutoff wall effect at various combinations of net recharge and head boundary conditions, pumping, and hydraulic conductivity.

15. SUBJECT TERMS

Computer Simulation	Groundwater model	Lake Okeechobee
Cutoff wall impact	Groundwater modeling system	Sensitivity analysis
	Herbert Hoover Dike	WASH123D

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	**b. ABSTRACT**	**c. THIS PAGE**			**19b. TELEPHONE NUMBER** *(include area code)*
UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED		451	

Standard Form 298 (Rev. 8-98)
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7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) (Concluded)

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